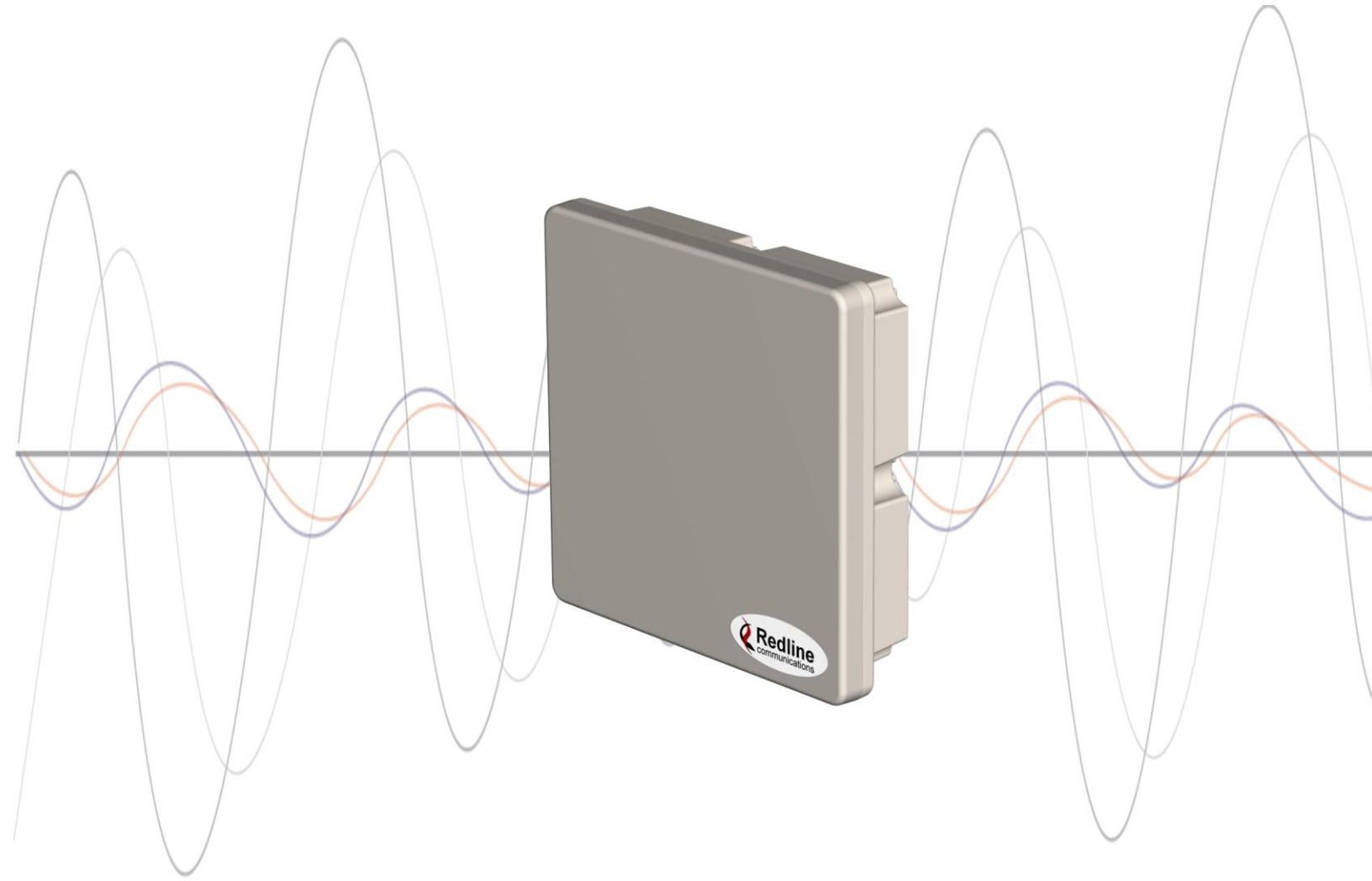
redline communications

SU-O

RedMAX™ Subscriber Unit Outdoors



User Manual

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Copyright Information

All rights reserved June 4, 2010. The information in this document is proprietary to Redline Communications Inc. This document may not in whole or in part be copied, reproduced, or reduced to any medium without prior consent, in writing, from Redline Communications Incorporated.

Disclaimer

The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Additionally, Redline makes no representations or warranties, either expressed or implied, regarding the contents of this product. Redline Communications shall not be liable for any misuse regarding this product. The information in this document is subject to change without notice. No part of this document shall be deemed to be part of any warranty or contract unless specifically referenced to be part of such warranty or contract within this document.

Software Versions

This user manual describes operation using software release v2.3x and may include references or features that are different or unavailable in previous software releases (refer to product release notes).

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

TABLE OF CONTENTS

1 Important Safety Notices 6
1.1 Safety Warnings 6
1.2 Important Warning Symbols 6
1.3 CSA Information 7
1.4 Information For Use In Canada 7
1.5 FCC Notice 8
1.6 FCC: Antenna/Tx Power Setting Combinations 8
1.7 Frequency Selection 9
1.7.1 General 9
1.7.2 R&TTE Directive 1999/5/EC Statements 9
1.8 WEEE Product Return Process 11
1.9 Important Service Information 11
2 Overview 12
2.1 Features 12
2.1.1 IEEE 802.16 WiMAX Compliance 12
2.1.2 PHY Specification 13
2.1.3 Time Division Duplexing (TDD) 13
2.1.4 Coding Rate 13
2.1.5 Modulation 13
2.1.6 Reed Solomon Error Correction 13
2.2 Deployment Models 13
2.2.1 PTP Deployment 13
2.2.2 PMP Deployment 14
2.2.3 Non Line-of-Sight 14
2.2.4 Channelization 15
2.3 Service Flows 15
2.3.1 Service Flow Classification 15
2.3.2 Dynamic Service Addition 16
2.3.3 Uplink Service Flow Scheduling 16
2.3.4 Downlink Service Flow Scheduling 16
3 Outdoor Subscriber Features 17
3.1 Integrated Antenna (SU-OIA) 17
3.2 Non Integrated Antenna (SU-ORF) 18
3.3 Subscriber Connections and Controls 19
3.3.1 Ethernet Port (and Cable) 19
3.3.2 RF Port 19
3.3.3 Grounding Connection 19
3.3.4 PoE (Power over Ethernet) Power Adaptor 20
3.4 Mounting the Outdoor Subscriber 21
3.4.1 Outdoor Subscriber with Integrated Antenna 21
3.4.2 Outdoor Subscriber with External Antenna 21
3.4.3 Antenna Alignment 21
4 CLI Commands 23
4.1 Introduction 23
4.2 CLI Modes 23

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.2.1 Telnet Connection 23
4.2.2 Root Commands 24
4.3 Mode Commands 25
4.3.1 boardConfig - Board Setup Commands 26
4.3.2 bsIdTable - Base Station ID Table Commands 27
4.3.3 collectRadio - RF Statistics 28
4.3.4 diagStatistics - Diagnostic Statistics 29
4.3.5 ethTag - Ethernet Tagging 31
4.3.6 installedVer - Installed Version 32
4.3.7 ipAddress - IP Address Commands 33
4.3.8 loadImage - Download and Activate Software Image 34
4.3.9 modThresh - Modulation Threshold 35
4.3.10 monitor - Monitor Mode 36
4.3.11 phyConfig - Physical Layer Configuration 37
4.3.12 privacySS - Privacy Commands 38
4.3.13 reset - Reset Command 38
4.3.14 rfConfig - RF Setup Commands 39
4.3.15 set - Set Commands 41
4.3.16 show - Show Commands 46
4.3.17 snmpAccCtrl 51
4.3.18 smcIpAddress: Assign Static Remote IP Address 52
4.3.19 snmpAccCtrl 53
4.3.20 softwareUpdate - Software Update Commands 54
4.3.21 status - Status Information 55
4.3.22 user 56
4.3.23 VLAN Filtering 56
5 Appendices 57
5.1 Subscriber Log Messages 57
5.2 Upgrade Subscriber 57
5.2.1 FTP Server 57
5.2.2 Upgrade Path 57
5.2.3 Connection to Subscriber 58
5.2.4 Update Software Procedure 58

LIST OF FIGURES

Figure 1: Notices - WEEE Symbol 11
Figure 2: Intro - RedMAX Subscriber Outdoor System 12
Figure 3: System - PTP Line of Sight Deployment 14
Figure 4: System - Fresnel Zone 14
Figure 5: System - Non-Line of Sight Deployment 15
Figure 6: SU-OIA System Features 17
Figure 7: SU-ORF System Features 18
Figure 8: Outdoor Ethernet Cable - Cable Connection 19
Figure 9: Optional Redline-Supplied PoE Power Adaptor 20
Figure 10: SU-OIA System Connections Diagram 21
Figure 11: SU-ORF System Connections Diagram 22

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Figure 12: Subscriber CLI Interface - Login Dialog 24
Figure 13: CLI - monitor - Monitor Screen..... 36

LIST OF TABLES

Table 1: Notices - Subscriber Station Antennas..... 7
Table 2: Notices - FCC: Antenna/Tx Power Setting Combinations..... 8
Table 1: Notices - R&TTE - Community Language CE Declarations..... 9
Table 2: Notices - R&TTE: Countries of Use (3.4 GHz & 3.6 GHz) 10
Table 3: System - PoE Ports 20
Table 4: System - Ethernet Data Port Link/Act LEDs 20
Table 5: CLI - Command Groups..... 23
Table 6: CLI - Root Mode Commands 24
Table 7: CLI - Root Mode Commands 25
Table 8: CLI - boardConfig - Board Commands..... 26
Table 9: CLI - bsIdTable - Base Station ID Commands 27
Table 10: CLI - bsIdTable - Base Station ID Commands..... 28
Table 11: CLI - diagStatistics - Diagnostic Statistics Commands 29
Table 12: CLI - ethTag - Ethernet Tagging Commands 31
Table 13: CLI - installedVer - Installed Version Commands..... 32
Table 14: CLI - ipAddress - IP Address Commands..... 33
Table 15: CLI - ipAddress - IP Address Commands..... 34
Table 16: CLI - modThresh - Modulation Threshold Commands..... 35
Table 17: CLI - monitor - Monitor Mode 36
Table 18: CLI - phyConfig - Physical Layer Commands..... 37
Table 19: CLI - privacySS - Privacy Commands 38
Table 20: CLI - reset - Reset Commands 38
Table 21: CLI - rfConfig - Radio Frequency Commands 39
Table 22: CLI - set - Modify Subscriber Parameters 41
Table 23: CLI - show - Show Commands 46
Table 24: CLI - snmpAccCtrl..... 51
Table 25: CLI - show - Show Commands 52
Table 26: CLI - snmpAccCtrl..... 53
Table 27: CLI - softwareUpdate - Software Update Commands..... 54
Table 28: CLI - status - Status Commands 55
Table 29: CLI - User Command 56
Table 30: CLI - status - Status Commands 56

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Chapter

1

1 Important Safety Notices

This manual describes features and operation of the outdoor SU-OIA/SU-ORF (SU-O) wireless subscriber modem.

1.1 Safety Warnings

1. Installation of the system must be contracted to a professional installer.
2. Read this user manual and follow all operating and safety instructions.
3. PoE (Power over Ethernet) power adaptor caution:

PoE Power Adapter Caution
Warning to Service Personnel: 48 VDC
Standard Ethernet equipment may be damaged if connected directly to the 'Data + Power Output' port of a PoE power adaptor.

4. The power requirements are indicated on the product-marking label. Do not exceed the described limits.
5. Disconnect the power before cleaning.
6. Disconnect power when unit is stored for long periods.
7. The outdoor unit must not be located near power lines or other electrical power circuits.
8. The system must be properly grounded to protect against power surges and accumulated static electricity. It is the user's responsibility to install this device in accordance with the local electrical codes: correct installation procedures for grounding of the outdoor unit, mast, lead-in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes.
9. Keep all product information for future reference.

1.2 Important Warning Symbols

The following symbols may be encountered during installation or troubleshooting. These warning symbols mean danger. Bodily injury may result if you are not aware of the safety hazards involved in working with electrical equipment and radio transmitters. Familiarize yourself with standard safety practices before continuing.

Electro-Magnetic Radiation

High Voltage

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

1.3 CSA Information

1. The equipment must be properly grounded according with NEC, ICEC, CEC, and others, and other local safety code and building code requirements.
2. To meet the over-voltage safety requirements on the telecommunications cables, a minimum 26 AWG telecommunication line cord must be used.

   Pour être en conformance avec les exigences finies de sûreté de sur-tension sur les câbles de télécommunications un fil de télécommunication ayant un caliber minimum de 26 AWG doit être utilisé.
3. Reminder to all the broadband wireless system installers: Attention to Section 820-40 of the NEC which provides guidelines for proper grounding, and in particular, specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as is practical.

1.4 Information For Use In Canada

Operation is subject to the following two conditions:

1. This device may not cause interference and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

IMPORTANT NOTICE: IC Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. To maintain compliance with IC RF exposure compliance requirements, please avoid direct contact to the transmitting antenna during transmitting. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

SU-OIA (integrated antenna): A separation distance of 20 cm or greater should be maintained between persons and the antenna of the SU-OIA during device operation.

SU-ORF (external antenna): A separation distance of 50 cm or greater should be maintained between persons and the antenna of the SU-ORF during device operation.

Table 1: Notices - Subscriber Station Antennas

Order Number	DEG	Gain (dBi)	GHz	Type	Polarization
A2014ARF	13.5	20	3.3 - 3.8	Panel	Vertical or Horizontal
A1815MTFD	15	16.5 18.5 18	3.3-3.4 3.4-3.7 3.7-3.8	Panel	Vertical or Horizontal
A2408MTF	8	24	3.3-3.8	Panel	Vertical or Horizontal

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

1.5 FCC Notice

1. The Model SU-O and its antenna (SU-ORF only) must be professionally installed.
2. WARNING -- FCC RF Exposure Warnings

   To satisfy FCC RF exposure requirements for RF transmitting devices, a minimum distance of 25 cm should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmitter must not be collocated in conjunction with any other antenna or transmitter.
3. Operation is restricted to the 50 MHz band 3.650-3.700 GHz (unrestricted contention based protocol for WiMAX devices).
4. FCC Information to Users @ FCC 15.21 & 15.105:

   This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
5. Warning: Changes or modifications not expressly approved by Redline Communications could void the user's authority to operate the equipment.

1.6 FCC: Antenna/Tx Power Setting Combinations

This device has been designed to operate with the antennas listed below, having a maximum peak gain of 20 dBi. The Max. Tx Power GUI Setting listed below for each antenna and channel size will limit the EIRP at any time to a maximum peak of 1W/1MHz (30 dBm). The maximum EIRP of this device must not exceed 35.5 dBm for 3.5 MHz channels, or 38.5 dBm for 7 MHz channels. Antennas not included in this list or having a peak gain greater than 20 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Table 2: Notices - FCC: Antenna/Tx Power Setting Combinations

Order Number	DEG	3.5 MHz Max. Tx Power GUI Setting	7 MHz Max. Tx Power GUI Setting
SU-OIA Integrated	16 dBi, 30 degree, vertical/horizontal polarization, 162 x 162 panel	19	20
SU-ORF + A1815MTFD	18 dBi, 15 degree, vertical/horizontal polarization, 305 x 305 panel	17	20
SU-ORF + A2014ARF	20 dBi, 14 degree, vertical/horizontal polarization, 336 x 336 panel	15	18

Adjustments to the transmit power settings must be made using the Tx power control settings in the rfConfig section of the command line interface (CLI).

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

1.7 Frequency Selection

1.7.1 General

Operation in the FWA band is subject to license. The radio power and channel frequency selections must be set correctly before the installed system is allowed to transmit. The installed system must comply with all governing local, regional, and national regulations. Contact authorities in the country of installation for complete information regarding the licensing regime and operating restrictions for that regulatory domain.

1.7.2 R&TTE Directive 1999/5/EC Statements

Installation

The transceiver and antenna equipment must be installed by a qualified professional installer and must be installed in compliance with regional, national, and local regulations. It is the responsibility of the system installer and/or system operator to ensure the installed system does not exceed any operational constraints identified by local regulations. Refer to the sections in this product User Guide for detailed information about the correct installation steps to ensure power and frequency settings are set correctly before connecting the antenna. Operation in the 3.4-3.6 GHz band is subject to license. Authorities within the country of installation can provide information regarding the licensing regime and restrictions.

Community Language Declarations

The following table contains community language versions of informal statement in accordance with Article 6.3 of Directive 1999/5/EC.

Table 1: Notices - R&TTE - Community Language CE Declarations

Community language versions of informal statement for inclusion in user information in accordance with Article 6.3 of Directive 1999/5/EC	
Danish	Undertegnede Redline Communications erklærer herved, at følgende udstyr subscriber overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
Dutch	Hierbij verklaart Redline Communications dat het toestel subscriber in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG
	Bij deze verklaart Redline Communications dat deze subscriber voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
English	Hereby, Redline Communications, declares that this subscriber is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	Redline Communications vakuuttaa täten että subscriber tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente Redline Communications déclare que l'appareil subscriber est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
	Par la présente, Redline Communications déclare que ce subscriber est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 1: Notices - R&TTE - Community Language CE Declarations	
German	Hiermit erklärt Redline Communications, dass sich *dieser/diese/dieses* subscriber in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi)
	Hiermit erklärt Redline Communications die Übereinstimmung des Gerätes subscriber mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek	*ΜΕ ΣΗΝ ΠΑΡΟΤΣΑ Redline Communications ΔΗΛΩΝΕΙ ΟΣΙ subscriber ΣΥΜΜΟΡΦΩΝΕΣΑΙ ΠΡΟΣ ΤΙΣ ΟΤΣΙΩΔΕΙΣ ΑΠΑΙΣΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΥΕΣΙΚΕΣ ΔΙΑΣΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ*
Italian	Con la presente Redline Communications dichiara che questo subscriber è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Portuguese	Redline Communications declara que este subscriber está conforme com os requisitos essenciais e outras provisões da Directiva 1999/5/CE.
Spanish	Por medio de la presente Redline Communications declara que el subscriber cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Swedish	Härmed intygar Redline Communications att denna subscriber står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

Table 2: Notices - R&TTE: Countries of Use (3.4 GHz & 3.6 GHz)					
Country	3400-3600 MHz	Country	3400-3600 MHz	Country	3400-3600 MHz
Austria	✓	Hungary	✓	Poland	✓
Belgium	✓	Iceland	✓	Portugal	✓
Bulgaria	✓	Ireland	✓	Romania	✓
Cyprus		Italy		Slovakia	✓
Czech Republic	✓	Latvia	✓	Slovenia	✓
Denmark	✓	Liechtenstein	✓	Spain	✓
Estonia	✓	Lithuania	✓	Sweden	✓
Finland	✓	Luxembourg	✓	Switzerland	✓
France	✓	Malta	✓	United Kingdom	✓
Germany	✓	Netherlands	✓		
Greece	✓	Norway	✓		

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

1.8 WEEE Product Return Process

In accordance with the WEEE (Waste from Electrical and Electronic Equipment) directive, 2002/96/EC, Redline Communications equipment is marked with the logo shown above. The WEEE directive seeks to increase recycling and re-use of electrical and electronic equipment. This symbol indicates that this product should not be disposed of as part of the local municipal waste program. Contact your local sales representative for additional information.

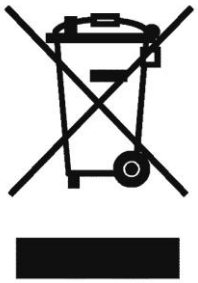


Figure 1: Notices - WEEE Symbol

1.9 Important Service Information

1. Refer all repairs to qualified service personnel. Do not remove the covers or modify any part of this device, as this voids the warranty.
2. Disconnect the power to this product and return it for service if the following conditions apply:
    a) The unit does not function after following the operating instructions outlined in this manual.
    b) Liquid has been spilled or a foreign object is inside.
    c) The product has been dropped or the housing is damaged.
3. Record the serial number on your registration card for future reference.
4. Redline does not endorse or support the use of outdoor cable assemblies: i) not supplied by Redline, ii) third-party products that do not meet Redline's cable and connector assembly specifications, or iii) cables not installed and weatherproofed as specified in the Installation Guidelines manual (70-00068-01-XX). Refer to the Redline Limited Standard Warranty and RedCare service agreements.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Chapter 2

2 Overview

Congratulations on your purchase of the Redline WiMAX Forum Certified™ subscriber wireless broadband product. Redline Communications is a world leader in design and production of WiMAX and proprietary Broadband Fixed Wireless (BFW) systems.

The outdoor subscriber is carrier class high-speed IEEE 802.16-2004 WiMAX compliant for point-to-point (PTP) and point-to-multipoint (PMP) deployment.

Figure 2: Intro - RedMAX Subscriber Outdoor System

2.1 Features

2.1.1 IEEE 802.16 WiMAX Compliance

The IEEE 802.16-2004 specifications describe a PMP broadband wireless access standard for systems operating in the frequency range of 2-11 GHz, and 10-66 GHz. This standard includes descriptions for both the Media Access Control (MAC) and the physical (PHY) layers. Note that the 802.16-2004 standards are subject to amendment, and the subscriber product design compliance applies to a specific revision of the standard. The RedMAX product does not support mesh communication, but does support subscriber-to-subscriber communication using TLS.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Redline is an active member of the WiMAX Forum™ and is participating in interoperability testing in the WiMAX Forum. Redline is also an active member of the IEEE 802.16-2004 standards committee and has been instrumental in creating the original 802.16-2004 standards, and is active in recommending, writing and following-up work on new amendments to the 802.16-2004 specifications.

2.1.2 PHY Specification

The subscriber system is designed for 2-11 GHz operation based on the WirelessMAN-OFDM PHY definition in the IEEE 802.16-2004 specifications. The subscriber uses Orthogonal Frequency Division Multiplexing (OFDM). OFDM is a multi-carrier transmission technique where the data stream is split and transmitted (at a reduced rate) in parallel streams on separate sub-carriers. OFDM uses the Fast Fourier Transform (FFT) algorithm to implement modulation and demodulation functions. Using adequate channel coding and bit-interleaving, OFDM performs very well in severe multipath environments, mitigates frequency-selective fading, and provides high spectral efficiency.

2.1.3 Time Division Duplexing (TDD)

The subscriber system uses time division duplexing (TDD) to transmit and receive on the same RF channel. The subscriber can also transmit and receive using separate RF channels, referred to as half-duplex FDD (HD-FDD). These are both non-contention based methods for providing an efficient and predictable two-way PTP or PMP cell deployment. All uplink and downlink transmission scheduling is managed by the WiMAX base station. The base station sends data traffic to subscribers, polls for grant requests, and sends grant acknowledgements based on the total of all traffic to all subscribers.

2.1.4 Coding Rate

Each burst of data transmitted over the air is padded with redundant information to make it resistant to errors introduced during transmission. The coding rate is the ratio of user data to the total data transmitted including the redundant error correction data. The subscriber supports coding rates of 1/2, 2/3, and 3/4.

2.1.5 Modulation

The modulation technique specifies how the data is coded within the OFDM carriers. The subscriber supports BPSK, QPSK, 16 QAM, and 64 QAM modulation.

2.1.6 Reed Solomon Error Correction

Outer Reed-Solomon and inward Convolution Coding (RS-CC) error correction is enabled for all traffic rates, with the exception of BPSK 1/2 where only inward Convolution Coding is used. These low-level processes can correct bursts of errors in received messages and reduce the number of retransmissions.

2.2 Deployment Models

The subscriber supports point to point (PTP) and point to multipoint (PMP) deployment scenarios.

2.2.1 PTP Deployment

When deployed in a PTP configuration the base station establishes a dedicated bi-directional link to a single subscriber. The PTP deployments typically use a directional narrow beam antenna for both ends of the link.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

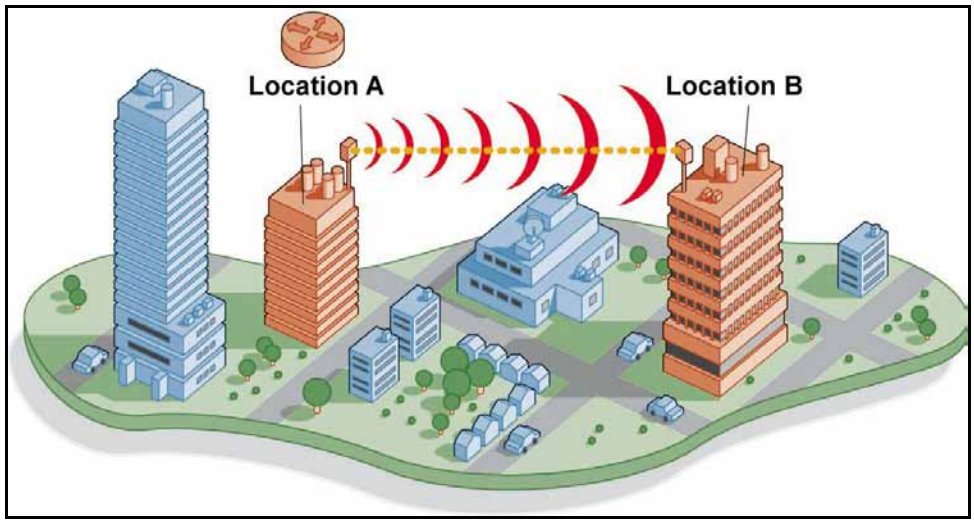


Figure 3: System - PTP Line of Sight Deployment

2.2.2 PMP Deployment

When deployed in a PMP configuration the base station establishes bi-directional links to more than one subscriber. The PMP deployments typically use a wide beam (sector) antenna at the base station and a narrow beam antenna at the subscriber. Service flows are used to police service level agreements for each subscriber.

2.2.3 Non Line-of-Sight

The subscriber system supports line-of-sight (LOS), optical line-of-sight (OLOS), and non line-of-sight (NLOS) operation. A clear LOS link has no obstacles within 60% of the first Fresnel zone of the direct path. An OLOS link has obstructions within 60% of the first Fresnel zone, but a visible path exists from the base station to the subscriber.

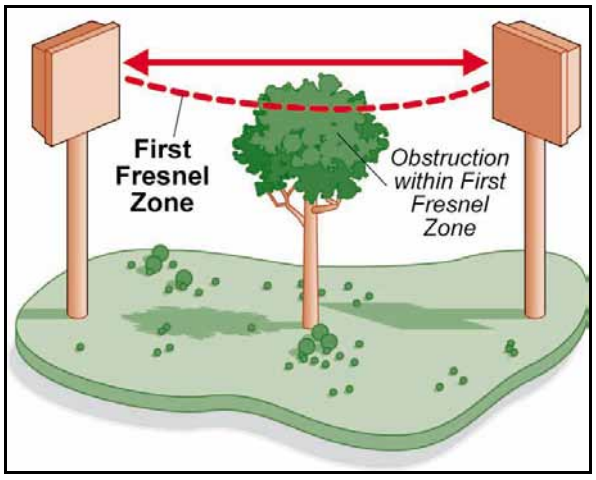


Figure 4: System - Fresnel Zone

A wireless link is considered non LOS if natural or man-made structures block the visible path between the base station and subscriber. In this case, a wireless link can be established only if a reflective path can be established between the base station and subscriber.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

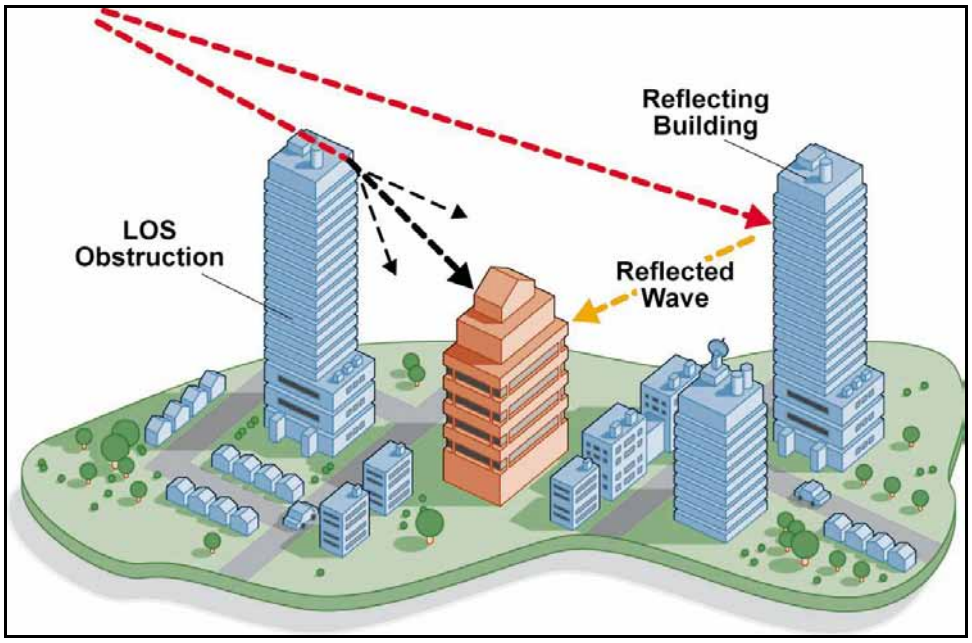


Figure 5: System - Non-Line of Sight Deployment

2.2.4 Channelization

The subscriber is a frequency-specific system, with the frequency band defined by the internal transceiver unit. The use of the operating band must be in accordance with European Conference of Postal and Telecommunications Administrations (CEPT) Recommendation 14-03.

The subscriber divides the available frequency band into channels. Allocation of channels during deployment is dependent on spectrum availability in the licensed FWA band (3400-3600 MHz) and local licensing requirements and conditions. Channel selection allows planners to obtain the maximum geographic coverage, while avoiding frequency contention in adjacent sectors.

2.3 Service Flows

Service flows are a key feature of the 802.16 standard. A Service Flow represents a unidirectional data flow having separate QoS settings for uplink and downlink. Service flows provide the ability to set up multiple connections to each subscriber in a sector.

Separate service flows can be established for uplink and downlink traffic, where each service flow is assigned a unique service level category and separate QoS settings. This feature allows segregation of high-speed/high-priority traffic from less time-critical flows.

2.3.1 Service Flow Classification

Data packets are forwarded by the subscriber based on classification rules. Classification rules require examining each packet for pattern matches such as destination address, source address, or VLAN tag. All classification is defined at the base station and the classification parameters are downloaded to the subscriber.

RedMAX supports service flows with different classification types including: 802.3 Ethernet, 802.1Q VLAN, IPV4, IPV4 Over 802.3 and IPV4 Over 802.1Q -- with options to classify based on Source and Dest of MAC and IP addresses, VLAN tag and Vlan priority, Src and Dst port number, TOS Value and Ethernet protocol type.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

2.3.2 Dynamic Service Addition

Service flows are defined and stored in the base station. For each service flow to be established, the base station sends a setup message to the subscriber specifying the required set of QoS parameters. The subscriber responds to each request by accepting or rejecting the setup message.

A service flow may be pre-provisioned or can be dynamically created and deleted without service outage. This is useful for supporting multiple subscribers in a single sector. New subscribers can be added and existing subscribers can be removed or have service levels modified.

Setup messages are sent by the base station following any subscriber power-cycle, loss and recovery of the wireless link to a subscriber, or any service flow add/delete operation at the base station.

2.3.3 Uplink Service Flow Scheduling

The base station enforces QoS settings for each service flow by controlling all uplink and downlink traffic scheduling. This provides non-contention based traffic model with predictable transmission characteristics. By analyzing the aggregate requests of all subscribers, the base station ensures that uplink and downlink traffic conforms with the current service level agreements (SLAs). Centralized scheduling increases traffic predictability, eliminates contention, and provides maximum opportunity for reducing overhead.

Real-Time Polling Service (rt-PS)

The base station schedules a continuous regular series of transmit opportunities for the subscriber to send variable size data packets. The grant size is based on the current data transfer requirement. Typical applications include streaming MPEG video or VOIP with silence suppression. This is efficient for applications that have a real-time component and continuously changing bandwidth requirements.

Non-Real-Time Polling Service (nrt-PS)

The base station schedules regular transmit opportunities for the subscriber to send variable size data packets. Typical applications may include high bandwidth FTP. The polling period may typically be one second or less, even during periods of network congestion.

Best Effort (BE)

The base station schedules transmit opportunities for the subscriber to send traffic based on unused bandwidth after all higher level traffic scheduling requirements are serviced. Typical applications may include Internet access and email. Best effort service flows can be assigned a priority of 0 to 7.

Unsolicited Grant Service (UGS)

The base station schedules a continuous series of transmit opportunities for the subscriber to send fixed size data packets. This schedule supports real-time applications including VoIP or TDM transport. The UGS pre-scheduled grants guarantee reserved bandwidth and reduce latency introduced by repetitive grant requests. The service flow will not transmit packets larger than nominal grant interval.

2.3.4 Downlink Service Flow Scheduling

The base station schedules downlink traffic on active service flows based on the minimum reserved data rate (CIR), traffic priority, and maximum latency.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Chapter 3

3 Outdoor Subscriber Features

The RedMAX subscriber can be deployed with an integrated antenna or an external antenna.

3.1 Integrated Antenna (SU-OIA)

This subscriber with integrated antenna consists of an outdoor radio (transceiver and antenna) and an indoor power-block with network connections. The subscriber electronics are housed in a weatherproof aluminum alloy case.

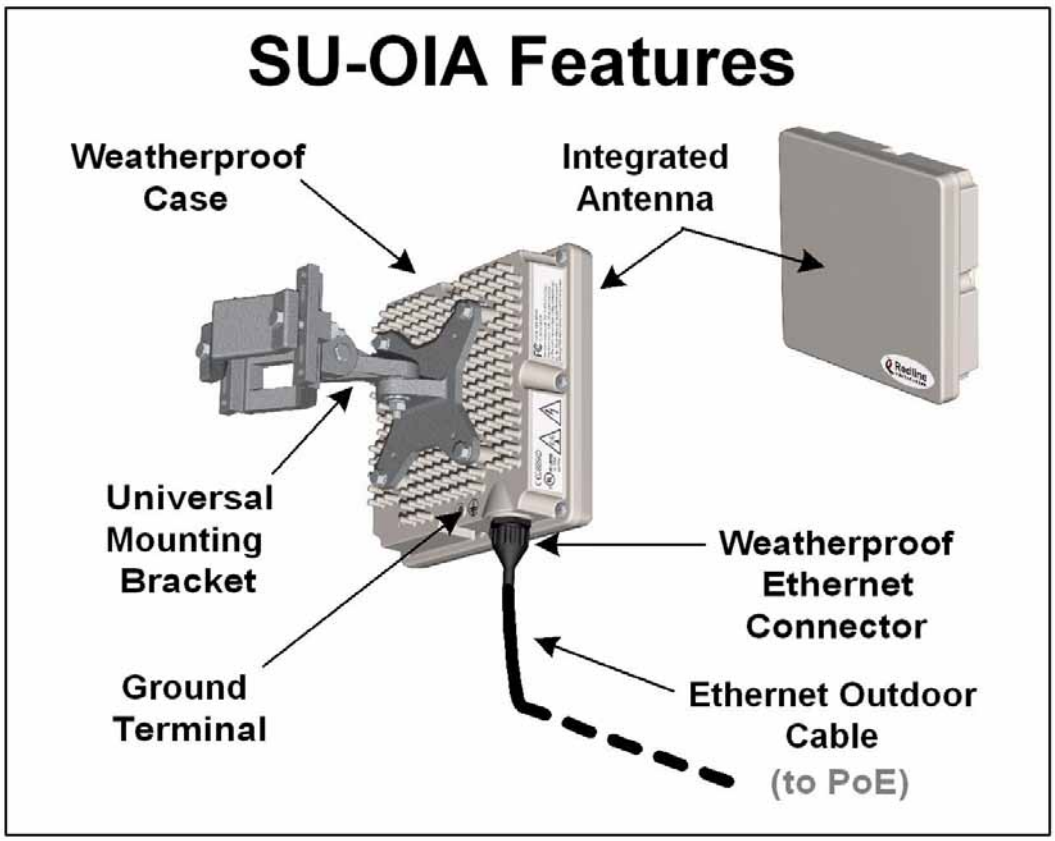


Figure 6: SU-OIA System Features

The SU-OIA system includes:

- Outdoor subscriber with integrated antenna
- Universal mounting bracket

Optional SU-OIA equipment includes:

- Outdoor Ethernet cable with weatherproof connector
- Indoor Power over Ethernet (PoE) power adaptor with AC power cord (NA/UK/EU)
- Lightning/surge protection

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

3.2 Non Integrated Antenna (SU-ORF)

This outdoor subscriber is housed in a weatherproof aluminum alloy case and features an RF connector for connection to an external antenna.

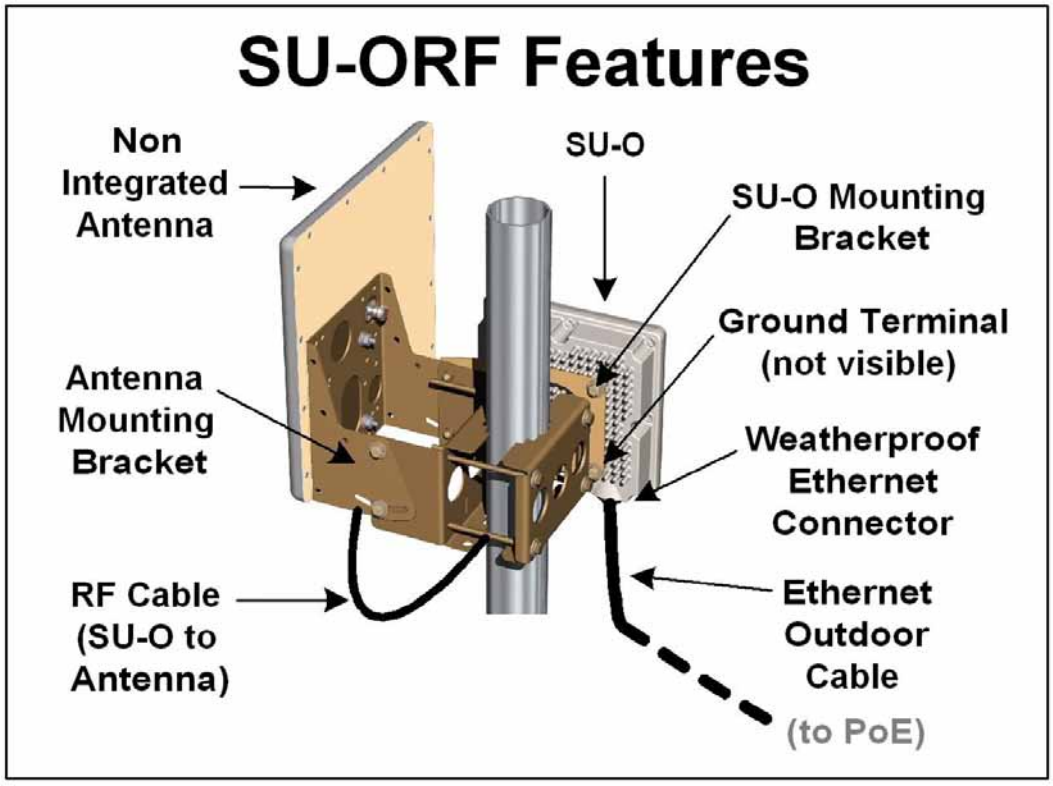


Figure 7: SU-ORF System Features

The SU-ORF system includes:

- Outdoor subscriber with N-type RF output
- Flat-plate mounting adapter
- Antenna
- Heavy duty mounting bracket
- 40 cm (16") RF cable (N-type connector, 50 Ohm)

Optional SU-OIA equipment includes:

- Outdoor Ethernet cable with weatherproof connector
- Indoor Power over Ethernet (PoE) power adaptor with AC power cord (NA/UK/EU)
- Lightning/surge protection

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

3.3 Subscriber Connections and Controls

3.3.1 Ethernet Port (and Cable)

The auto-sensing 10/100Base-T Ethernet port connects through the outdoor Ethernet cable to a PoE power adaptor/CO switch. The SU-O receives DC power and exchanges data with the network through this port (straight-through connection).

The SU-O cable access entrance is equipped with a weatherproof seal. The outdoor end of the Redline supplied outdoor (hardened) CAT-5 Ethernet cable is terminated with an environmentally sealed RJ-45 connector for connection to the subscriber. The minimum diameter to pass this connector through a conduit or hole is 26 mm (1 in).

The indoor end of the Redline supplied outdoor (hardened) CAT-5 Ethernet cable is terminated with a standard indoor RJ-45 connector for connection to a PoE power adaptor/CO switch. The minimum diameter to pass this connector through a conduit or hole is 18 mm (11/16 in).

Important -- Warranty Information -- Ethernet Cable

Redline does not endorse or support the use of outdoor cable assemblies: i) not supplied by Redline, ii) third-party products that do not meet Redline's cable and connector assembly specifications, or iii) cables not installed and weatherproofed as specified in the Installation Guidelines manual (70-00068-01-XX). Refer to the Redline Limited Standard Warranty and RedCare service agreements.

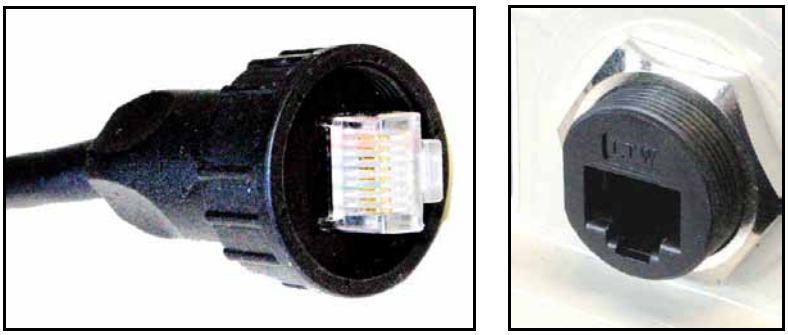


Figure 8: Outdoor Ethernet Cable - Cable Connection

3.3.2 RF Port

An external RF connector is provided only on the outdoor subscriber with external antenna (SU-ORF) model. The transceiver RF port (female N-type connector) is used for sending/receiving the RF signal to/from the antenna. A short coaxial cable is provided to connect the transceiver to the antenna.

3.3.3 Grounding Connection

A ground terminal is located on the rear of the subscriber. Use this screw to terminate the ground wires. Correct grounding is very important for safe operation of wireless equipment. Ensure that all grounding connections are in accordance with local and national standards.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

3.3.4 PoE (Power over Ethernet) Power Adaptor

The SU-O may be powered using a stand-alone PoE power adaptor, or by a central office switch equipped with RJ-45 sockets that provide PoE power and data to the SU-O device. All PoE devices must have metal-lined RJ-45 sockets that provide a protective ground connection to the Ethernet cable shield. The PoE power adaptor may be supplied by Redline as a stand-alone AC powered device.

Important -- PoE Equipment

The Ethernet outdoor cable is supplying a protective ground connection for the Ethernet cable. Customer supplied PoE devices (e.g., central office* switches equipped with RJ-45 sockets that provide PoE power and data*) must have metal-lined RJ-45 sockets providing a protective ground connection to the cable shield.

Redline Supplied PoE Power Adapter

The Redline supplied PoE power adaptor source is auto-sensing 110-240 (nominal) VAC. The PoE power adaptor provides two Ethernet interfaces:

Table 3: System - PoE Ports

Port	Description
DATA IN	The auto-sensing 10/100Base-T Ethernet port (RJ-45 socket) for connection to the network equipment.
DATA & POWER OUT	The auto-sensing 10/100Base-T Ethernet port (RJ-45 socket) port is used to carry signals and source power to the outdoor subscriber outdoor unit.

Figure 9: Optional Redline-Supplied PoE Power Adaptor

Table 4: System - Ethernet Data Port Link/Act LEDs

LED	Port	Power Output
Solid	Connected	Power is active
Blink	Not connected	Out of range

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

3.4 Mounting the Outdoor Subscriber

Refer to the RedMAX Installation Guide (P/N: 70-00059) for detailed instructions.

3.4.1 Outdoor Subscriber with Integrated Antenna

The SU-OIA has an integrated flat panel antenna. The vertical mount bracket can accommodate a flat vertical surface or 2.45 - 11.45 cm (1 - 4 ½ in) OD masts found on many commercial tower installations.

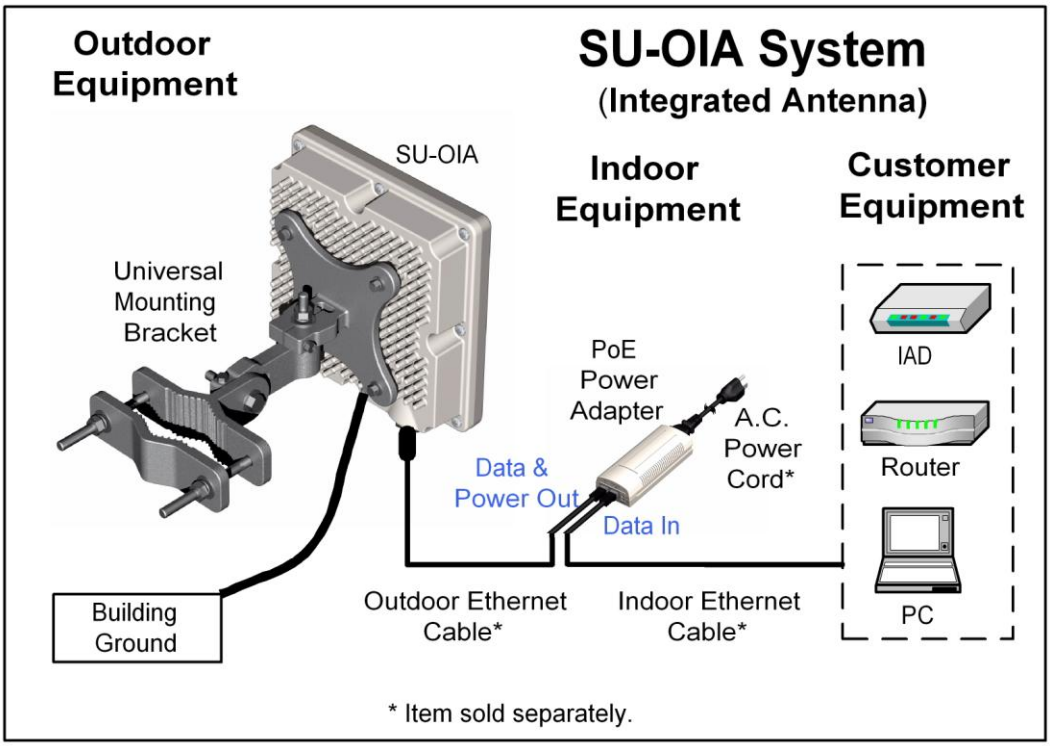


Figure 10: SU-OIA System Connections Diagram

3.4.2 Outdoor Subscriber with External Antenna

The SU-ORF system is supplied with an N-type RF connector for connection to an external high gain antenna. The vertical mount bracket can accommodate most 4.45 cm to 11.45 cm (1 ¾' - 4 ½ in) OD masts found on many commercial tower installations.

3.4.3 Antenna Alignment

The outdoor subscriber includes an audible antenna alignment tool to assist in pointing the antenna for maximum signal strength. The signal will sound infrequently when a low signal is detected, and more often as the signal strength increases. Refer to the outdoor subscriber Installation Guidelines for detailed information.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

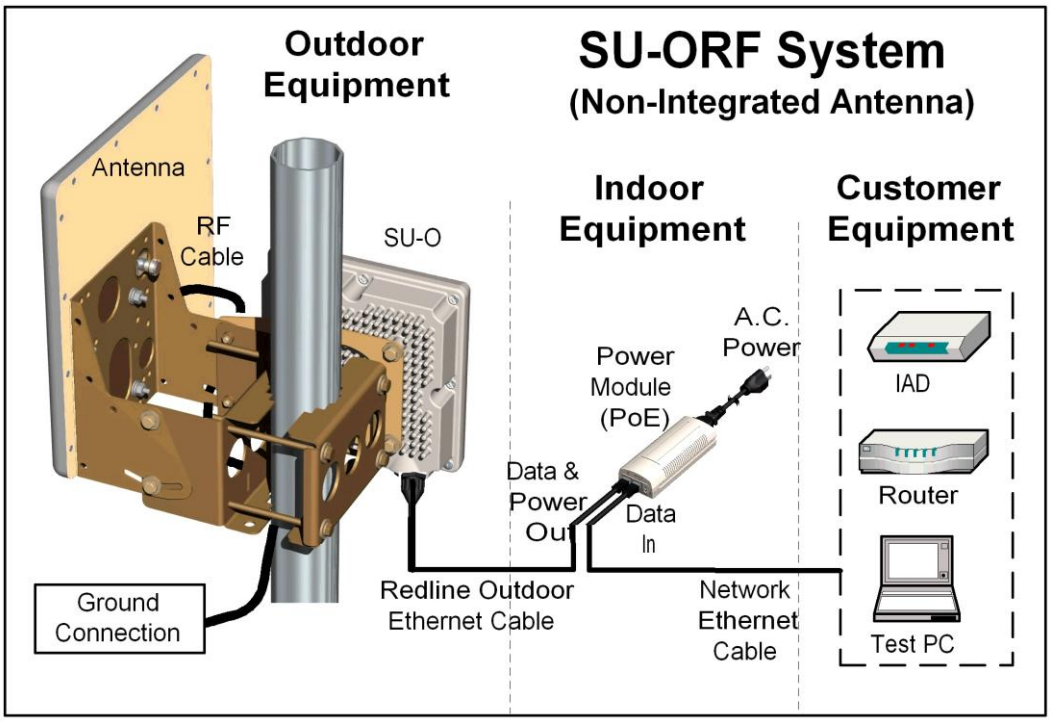


Figure 11: SU-ORF System Connections Diagram

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Chapter 4

4 CLI Commands

This section describes the subscriber CLI commands.

Important: Access to these commands is password protected. Only authorized professional installation and service personnel are allowed access to these controls.

4.1 Introduction

The subscriber can be configured using a Telnet connection established through the subscriber Ethernet port or over the wireless interface from the base station. The CLI can not be used to setup service flows. All service flows will be setup by the base station.

4.2 CLI Modes

The subscriber CLI interface supports several modes of operation. From root mode you can display a list of all user modes, reboot the subscriber system, and logout from the Telnet session. Monitor mode provides a dynamic display of the current system statistics, updated each few seconds. Configuration modes allow you to view and adjust the subscriber network and wireless settings.

4.2.1 Telnet Connection

Telnet Login

Type 'telnet' followed by the IP address of the subscriber system, depress ENTER, and enter the account and password when prompted. The subscriber supports two separate user accounts:

Table 5: CLI - Command Groups

Account	Password	Description
admin	admin	Full system control
user2	user2	Read-only with some functional restrictions (not allowed to use the 'set' command).
guest	guest	Same as user2.

Telnet Logout

To exit from the Telnet session, you must be in the root directory. Go to the root directory by typing:

Exit [ENTER] or CTRL-Z (hold down the CTRL key and depress Z)

Exit from a CLI session by typing:

logout [ENTER]

The system prompts for logout confirmation. Depress 'Y' to complete the logout process.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

The system displays a welcome message when successfully logged in.

Figure 12: Subscriber CLI Interface - Login Dialog
Login: admin Password: admin SUI#>

4.2.2 Root Commands

The following CLI commands are common to all configuration modes.

Table 6: CLI - Root Mode Commands	
Command	Description
?	Use the '?' character as an alternative to typing 'help <*ENTER*>'. Example: Enter the following command string to list all parameters that can be changed using the 'set' command: set ?
exit	Return to root mode.
help	Type 'help' alone to display the available commands. Type a command followed by 'help' to display a command set. *help <ENTER>* *Help for all functions/fields.*
logout	Exit the current Telnet session.
collectRadio	Factory test only.
reboot	Reset the system. Confirmation is required.
shell	Factory test only.
CTRL-Z	Return to root mode.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3 Mode Commands

The system defaults to root mode when you login to the subscriber. The following table lists commands that have their own mode. From each mode, you can directly display and modify (if applicable) each of the modes parameters. Enter 'exit' or CTRL-Z to return to root mode. All commands are case-sensitive.

The following table lists mode commands available from the root directory.

Table 7: CLI - Root Mode Commands

Command	Description
boardConfig	Display/modify the board parameter configuration.
bsIdTable	Access the Management Base Station ID table.
diagStatistics	View/modify the Diagnostic Status.
ethTag	View/modify the Ethernet Tagging.
installedVer	View the installed software version(s).
ipAddress	View/modify the IP address.
loadImage	Download and run a new software image.
modThresh	View/modify thresholds for adaptive modulation.
monitor	View dynamically updating values for all status table statistics.
phyConfig	View/modify the PHY configuration.
privacySS	View/modify privacy settings.
reset	Reset table of detected base stations.
rfConfig	View /modify the RF configuration.
set	Enter new parameters values.
show	Display current parameter settings.
smcIpAddress	View /modify SMC IP address settings.
softwareConfig	Backup/restore configuration settings.
softwareUpgrade	Upgrade software and select the active version.
status	Display the Management Status.
user	View/modify user account settings.
vlanFilters	View/modify the VLAN filter settings.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.1 boardConfig - Board Setup Commands

The boardConfig mode allows you to view and modify the subscriber board level settings. The following table lists all commands available in this mode.

Table 8: CLI - boardConfig - Board Commands

Command	Description
reset	Set all parameters to factory default values. Confirmation required.
set	Change parameter settings. **RefOscFreq**: Enter an unsigned integer as the new RefOscFreq value (Hz). Value can be only 32000000 or 40000000. **TxIfFreq**: Enter the TxIfFreq (Hz) value (around 44000000). **RxIfFreq**: Enter the RxIfFreq (Hz) value (around 44000000). **RfType**: Enter an unsigned char as the new RfType value. One of: 0 - None 1 - Radia 3.5 GHz 2 - Radia 5.8 GHz 3 - SMI 4 - Factory Test **IfPresent**: Enter an unsigned char as the new IfPresent value. 0 - Baseband only 1 - IF present **TxSpectrumInv**: Enter a boolean as the new TxSpectrumInv value. **RxSpectrumInv**: Enter a boolean as the new RxSpectrumInv value. **Buzzer**: Antenna positioning buzzer. 0 - Disabled 1 - Enabled. **DebugLog**: Factory debug messages. 0 - Disabled. 1- Enabled.
show	Display the current setting for all parameters. For example: *Structure --- <<SS Mmgt Board Configuration Parameter>>* *Transmit* *IfFreq: 44000000Hz* *SpectrumInv: disabled(0)* *Receive* *IfFreq: 44000000Hz* *SpectrumInv: disabled(0)* *Others* *RefOscFreq: 32000000Hz* *RfType: SMI(3)* *IfPresent: IF_Present(1)* *Buzzer: disabled(0)* *DebugLog: disabled(0)*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.2 bsIdTable - Base Station ID Table Commands

The bsIdTable includes the MAC addresses of up to sixteen base stations. The subscriber is authorized to register only with the base stations listed in this table. If this table is empty, the subscriber can register with any base station detected during the frequency scan (see 4.3.14: rfConfig - RF Setup Commands on page 39).

The operator can specify a preferred base station (bsIdTable). This selection receives priority whenever the subscriber must select a base station. Each base station ID table entry includes a priority value from 0 (highest) to 15. When multiple entries have the same priority (default priority is 7), selection is based on CINR.

Table 9: CLI - bsIdTable - Base Station ID Commands

Command	Description
add	Add or modify a base station ID entry. The count value will be adjusted to reflect the current number of effective entries. If the table position value is not specified, the entry will be made following the last valid entry. **BsId** - Base station MAC address **Priority** - Priority (0-15) <**EntryNumber**> - Entry position in the table (0-15) For example, add a new base station entry with priority 7 in position 1: `SUI# bsIdTable add BsId 00:09:02:00:a3:5d Priority 7 1`
delete	Delete a base station ID entry. The count value will be adjusted to reflect the current number of effective entries. If the table position value is not specified, the last valid entry in the table is deleted. **EntryNumber**: The entry position in the table.
show	Display the base station ID table entries. If the table position value is not specified, all entries in the table are displayed. If the keyword 'monitor' is used, the display is updated continually. **EntryNumber**: The entry position in the table. **Monitor**: Dynamically updated display of table values.

Notes:

The following actions are taken when the bsIdTable is modified:

1. A 'Detected BS table reset' log message is generated.
2. An 'Add detected BS…' log message is generated if a new entry is added to the table.
3. A frequency scan is initiated (see 4.3.14: rfConfig - RF Setup Commands on page 39).

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.3 collectRadio - RF Statistics

The collectRadio command is used to continuously transmit Rssi, Snr, FreqOffset, RfRssi and Link Status information. This is intended as a machine-to-machine interface (e.g., CelSignal interface for the Cell Plan application).

Table 10: CLI - bsIdTable - Base Station ID Commands	
Command	Description
time	Display or set the period to sample data (milliseconds). **time *[miliseconds]***
get	Begin continuously (once per second) sending information for the following parameters: Rssi, Snr, FreqOffset, RfRssi and Link Status. Transmission continues until any key is pressed. **get (no parameters)** Parameter values are sent in the following format: **27 fieldId1 fieldLen1 dataString1 fieldId2 fieldLen2 dataString2** ...

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.4 diagStatistics - Diagnostic Statistics

Use the Diagnostic Statistics commands to monitor specific operations for the subscriber. The following table lists all commands available in this mode.

Table 11: CLI - diagStatistics - Diagnostic Statistics Commands

Command	Description
list	Display the current values for all statistics. TxPowerMin: Minimum transmit power level used. TxPowerMax: Maximum transmit power level used. TxPowerAvg: Average transmit power level used. DlModCodeMin: Minimum downlink coding value used. DlModCodeMax: Maximum downlink coding value used. DlModCodeAvg: Average downlink coding value used. UlModCodeMin: Minimum uplink coding value used. UlModCodeMax: Maximum uplink coding value used. UlModCodeAvg: Average uplink coding value used. CinrMin: Minimum measured CINR value. CinrMax: Maximum measured CINR value. CinrAvg: Average measured CINR value. PhyRssiMin: Minimum measured RSSI value (physical layer). PhyRssiMax: Maximum measured RSSI value (physical layer). PhyRssiAvg: Average measured RSSI value (physical layer). RfRssiMin: Minimum measured RSSI value (radio). RfRssiMax: Maximum measured RSSI value (radio). RfRssiAvg: Average measured RSSI value (radio). CableCompMin: Minimum cable compensation value used. CableCompMax: Maximum cable compensation value used. CableCompAvg: Average cable compensation value used. FreqOffsetMin: Minimum frequency offset used. FreqOffsetMax: Maximum frequency offset used. FreqOffsetAvg: Average frequency offset used. MacResets: Number of times MAC layer has been reset. CRCErrors: Number for CRC errors detected. HeaderErrors: Number for packet header errors detected. DlSdus: Number of downlink SDUs received. DlMpdus: Number of downlink PDUs received. UlSdus: Number of uplink SDUs sent. UlMpdus: Number of uplink PDUs sent. tx: Show transmit group of statistics. dl: Show downlink group of statistics. ul: Show uplink group of statistics. cinr: Show CINR group of statistics. phy: Show PHY group of statistics. rf: Show RF group of statistics. cable: Show Cable Compensation group of statistics. freq: Show Frequency Offset group of statistics. other: Show Others group of statistics.
reset	Set all parameters to the last measured value. Can also be applied to groups of statistics (i.e., tx group).

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 11: CLI - diagStatistics - Diagnostic Statistics Commands	
show	Display the current setting for all parameters. For example: *Structure --- <<SS Diagnostic Statistics>>* *Transmit Downlink General Uplink General CINR* *---------- ---------- ---------- ----------* *PowerMin:...-4.1 dBm ModCodeMin:....6 ModCodeMin:....6 Min:.....30.5 dB* *PowerMax:...-4.1 dBm ModCodeMax:....6 ModCodeMax:....6 Max:...38.3 dB* *PowerAvg:...-4.1 dBm ModCodeAvg:....6 ModCodeAvg:....6 Avg:.....34.5 dB* *Sdus:.....116 Sdus:.....51* *Mpdus:.....516 Mpdus:.....68* *PHY RF Cable Compensation Frequency Offset* *---------- ---------- ---------- ----------* *RssiMin:...-16.8 dB RssiMin:...-49.6 dB CompMin:.....0 OffsetMin:....-1* *RssiMax:...-15.8 dB RssiMax:...-48.6 dB CompMax:.....0 OffsetMax:..4* *RssiAvg:...-16.2 dB RssiAvg:...-49.0 dB CompAvg:.....0 OffsetAvg:....0* *RxCalStatus:...1* *TxCalStatus:...1* *Others* *----------* *MacResets:.....0* *CRCErrors:.....0* *HeaderErrors:..0*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.5 ethTag - Ethernet Tagging

Use these commands to identify data traffic through this subscriber by using 802.1Q VLAN tags. The following table lists all commands available in this mode.

Table 12: CLI - ethTag - Ethernet Tagging Commands

Command	Description
reset	Set all ethTag parameters to factory default values.
set	Change parameter settings. **Active**: 0: Disabled - All ethTag features are disabled. 1: Enabled - Each upstream packet received on the subscriber Ethernet port is tagged with the specified VID (value field). If the packet has an existing VLAN tag, a new outermost tag is added (Q in Q). The modified packet is then forwarded over the wireless interface to the base station. **FilterOn**: 0: Disabled - All packets are forwarded unmodified. 1: Enabled - All downlink packets are classified according to the outermost VLAN tag. Packets with a VLAN tag matching the Value field have the VLAN tag removed and are then forwarded to the subscriber Ethernet port. All non-matching packets are discarded. **Priority**: Enter the priority to be assigned to each VLAN tagged packet to be sent over the wireless interface (uplink) to the sector controller. **PriorityCopy**: 0: Disabled - The Priority field value is inserted into the VLAN tags. 1: Enabled - If the received packet has a VLAN tag, the tags priority value is copied to the new VLAN tag being added (Q in Q), otherwise, the Priority field value is used. **Value**: Enter the VLAN ID. This is the VLAN tag added to uplink packets (active=1), and used to filter downlink packets (FilterOn=1).
show	Display the current setting for all parameters. For example: *Structure --- <<SS Ethernet Tagging Data>>* *Active:.....inactive(0)* *Priority:.....0* *FilterOn:.....0* *PriorityCopy...0* *Value:.....0*

Note: The base station passes all ingress and egress traffic without modification.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.6 installedVer - Installed Version

Use the installed version command to view information about the binary files saved in the subscriber non-volatile RAM, and to select the active version of software. See also installedVer, loadImage, and version commands. The following table lists all commands available in this mode.

Table 13: CLI - installedVer - Installed Version Commands

Command	Description
set	Switch the active version of image. **Active** - Load the binary file from the selected partition: 0 - Load from partition #0. 1 - Load from partition #1.
show	Display the current setting for all parameters. **Partition #0**: MajorNumber: Major software release number. MinorNumber: Minor software release number. ReleaseNumber: Software release build number. Designation: Software release designation. **Partition #1**: MajorNumber: Major software release number. MinorNumber: Minor software release number. ReleaseNumber: Software release build number. Designation: Software release designation. **Active**: Indicate the active partition. 0: Partition 0 will be loaded at reboot. 1: Partition 1 will be loaded at reboot. For example: *Partition #0 Partition #1 Others* *---------- ---------- ----------* *MajorNumber:.....1 MajorNumber:.....1 Active:.....1* *MinorNumber:.....0 MinorNumber:.....0* *ReleaseNumber:..100 ReleaseNumber:...98* *Designation:.....1 Designation:.....1*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.7 ipAddress - IP Address Commands

Use the IP address commands to view network address settings and modify subscriber IP address settings. The following table lists all commands available in this mode.

Table 14: CLI - ipAddress - IP Address Commands

Command	Description
set	Change IP address parameter settings. **Address**: IP address assigned to subscriber. Static address only. **Mask**: 255.255.255.0 *Example: Set a static IP address and mask value:* *set ipAddress 192.168.20.33 Mask 255.255.255.0*
show	Display the current IP address settings. For example: show ipAddress *Structure --- <<SS IP Address Data>>* *Address:.....192.168.25.100* *Mask:.....255.255.255.0*
reset	Reset the IP address to factory default. Requires confirmation.

Local Ethernet Port (Secondary Management) IP

All factory-shipped subscribers have the following local Ethernet port IP addresses:

Fixed: 192.168.101.1 (well-known, can not be modified)

Default: 192.168.101.2 (can be modified using CLI)

Over-the Air (Secondary Management) IP

When a subscriber is enabled for remote management (managedSS=1), the over-the-air secondary management channel (SMC) IP address can be assigned by:

a) DHCP request through the base station (acting as a DHCP relay agent).

b) The operator assigning a static IP address (see smcIpAddress command).

The DHCP exchange includes a request for the address of a ToD server (option 4), and the time offset (option 2) specifying the time zone where the subscriber is operating (seconds from GMT). The DHCP server must be located on the network connected to the base station Ethernet port. The subscriber can not use any DHCP server on the network connected directly to the subscriber Ethernet port.

The subscriber does not keep a record of the previously assigned IP, and the IP request field is empty during its initial request. If the lease has expired since the last time the subscriber requested an address, the DHCP server may assign a new IP address. Use one of the following methods to ensure the subscriber always receives the same IP:

a) Use an indefinite lease timeout (if supported).

b) Create a static address reservation for your subscriber (if supported).

Time-of-Day Server

The use of ToD service is optional. When a Time-of-Day (ToD) server is required, the server must be located on the network connected to the base station Ethernet port. The subscriber can not use a ToD server located on the network connected directly to the subscriber Ethernet port.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 15: CLI - ipAddress - IP Address Commands	
ToD Server	
Available	If the subscriber is able to contact the ToD server following each reboot, the subscriber clock is synchronized to the received time.
Not Available	If the subscriber can not contact the ToD server, the subscriber clock is set to midnight January 1, 1970 GMT.

4.3.8 loadImage - Download and Activate Software Image

The loadImage command can be used to update the subscriber software using a remote TFTP server. The following provides and example update session. After a successful download, a reboot will cause the subscriber to automatically load the new software image.

Example Download Dialog with Subscriber
Login: admin Password: admin, welcome to the SS CLI. (Version 0.3) SUI#> loadImage Server IP Address: *[enter ftp server IP address here]* File Name: *[enter binary file name here]* Opening FTP connection.....Done Downloading image ..... Done Programming update.....Done Erasing setup partition. Done. Writing setup partition. Done. Erasing boot block. Done Programming boot block. Done Flash programming complete. SUI#>reboot

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.9 modThresh - Modulation Threshold

Use the modulation threshold commands to view and adjust the settings for adaptive modulation. These setting are made at the factory and should only be adjusted by experienced personnel. The following table lists all commands available in this mode.

Table 16: CLI - modThresh - Modulation Threshold Commands

Command	Description
reset	Set all parameters to factory default values. Requires confirmation.
set	Change parameter settings. **Rate1Exit**: RW Rate 1 exit threshold. Value > 0 **Rate1Entry**: RW Rate 1 entry threshold. Value > Rate1Exit **Rate2Exit**: RW Rate 2 exit threshold. Value > Rate1Entry **Rate2Entry**: RW Rate 2 entry threshold. Value > Rate2Exit **Rate3Exit**: RW Rate 3 exit threshold. Value > Rate2Entry **Rate3Entry**: RW Rate 3 entry threshold. Value > Rate3Exit **Rate4Exit**: RW Rate 4 exit threshold. Value > Rate3Entry **Rate4Entry**: RW Rate 4 entry threshold. Value > Rate4Exit **Rate5Exit**: RW Rate 5 exit threshold. Value > Rate4Entry **Rate5Entry**: RW Rate 5 entry threshold. Value > Rate5Exit **Rate6Exit**: RW Rate 6 exit threshold. Value > Rate5Entry **Rate6Entry**: RW Rate 6 entry threshold. Value > Rate5Exit
show	Display the current setting for all parameters. For example: *Structure --- <<Modulation Rate Threshold Parameters>>* *Rate1Exit:.....9.50 dB* *Rate1Entry:.....10.50 dB* *Rate2Exit:.....12.00 dB* *Rate2Entry:.....13.00 dB* *Rate3Exit:.....16.50 dB* *Rate3Entry:.....17.50 dB* *Rate4Exit:.....19.50 dB* *Rate4Entry:.....20.50 dB* *Rate5Exit:.....23.00 dB* *Rate5Entry:.....24.00 dB* *Rate6Exit:.....26.00 dB* *Rate6Entry:.....27.00 dB*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.10 monitor - Monitor Mode

The ***monitor*** command allows you to view a dynamically updated screen of statistics for the subscriber.

Table 17: CLI - monitor - Monitor Mode	
Command	Description
monitor	Monitor subscriber RF parameters in real time (one second updates).

```
Rssi:                 Snr:                  FreqOffset:           TCnt:
  -15.3                 30.7                  0                     0

ModemResets:          DlfpCount:            DlfpErrCount:         DlfpCrcCount:
  2                     93855713              0                     0

DlMapCount:           DlMapErrCount:        DlMapCrcCount:        UlMapCount:
  3753920               0                     0                     93855713

UlMapErrCount:        UlMapCrcCount:        DcdRxCount:           DcdErrCount:
  0                     0                     469240                0

DcdCrcCount:          UcdRxCount:           UcdErrCount:          UcdCrcCount:
  0                     469240                0                     0

MgmtRxCount:          MgmtErrCount:         MgmtCrcCount:         LostFrames:
  15313                 0                     0                     0

FrameDuration:        DcdChangeCount:       RngTimeCorrection:    DlByteCount:
  10000                 0                     -63                   0

DlSduCount:           DlMpduCount:          DlHCrcErrCount:       DlCrcErrCount:
  313891                313899                0                     0

UlByteCount:          UlSduCount:           UlMpduCount:          TotalHCrcErrors:
  77488873              313827                313982                0

TotalCrcErrors:       TotalTxBurstCount:    TotalRngReqCount:     TotalBwReqCount:
  0                     5222017               2                     324155

TotalMgmSentCount:    TotalPaddingCount:    RfRssi:               TxPower:
  15299                 318898                -35.0                 -12.0

LinkStatus:
  Registered(1)

Press any key to exit monitor mode ...
```

Figure 13: CLI - monitor - Monitor Screen

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.11 phyConfig - Physical Layer Configuration

The phyConfig mode allows you to view and modify the subscriber physical layer (PHY) settings. The following table lists all commands available in this mode.

Table 18: CLI - phyConfig - Physical Layer Commands

Command	Description
reset	Set all parameters to factory default values. Requires confirmation.
set	Change physical layer parameter settings. **Bandwidth**: Channel size (KHz). Selections are: 3500, and 7000. **FftSize**: OFDM fft size. Settings are: 128, 256, 512, and 1024. *Note: Only 256 fft is valid for IEEE 802.16-2004 base stations.* PsPerOFDMSymbol: Physical slots per OFDM symbol value in PS. **SmplFactorNum**: Above the fraction line in the sampling factor (ns). Normally set to 8 nsec. **SmplFactorDen**: Under the fraction line in the sampling factor (ns). Normally set to 7 nsec. **CyclicPrefix**: Cyclic prefix (CP). The guard interval is used to factor out multipath effect. Valid settings are: 4 and 16 (default). *Example: Enter the following command string to set the channel size to 3500 KHz:* *set Bandwidth 3500 [Enter]*
show	Display the current setting for all parameters. For example: *Structure --- <<SS Mmgt PHY Configuration Parameter>>* *Bandwidth:.....3500 kHz* *FftSize:.....256* *PsDuration:.....1000* *PsPerOFDMSymbol:....68* *SmplFactorNum:.....8* *SmplFactorDen:.....7 nsec* *CyclicPrefix:.....16 PS*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.12 privacySS - Privacy Commands

The privacySS mode allows you to view and modify the privacy settings for the subscriber. The following table lists all commands available in this mode.

Table 19: CLI - privacySS - Privacy Commands

Command	Description
set	Change privacy related settings on subscriber. All times are in seconds. **Enable:** 0 -- Disable privacy. 1 -- Enable privacy. **UseTestTimers***:* 0 -- Use programmed timers 1-- Use test defaults.
show	Display privacy related settings on subscriber. For example: *Structure --- <<SS privacy Data>>* *Enabled:.....Disabled(0)* *UseTestTimers:.....Normal(0)* *AuthWaitTime:.....10* *ReauthWaitTime:.....10* *AuthGraceTime:.....600* *OperationalWaitTime:1* *RekeyWaitTime:.....1* *TekGraceTime:.....3600* *AuthRejectWaitTime:.60*

4.3.13 reset - Reset Command

The reset command is allows you to change the specified parameter (set) to factory default values. The following table lists all commands available in this mode.

Table 20: CLI - reset - Reset Commands

Command	Description
detectedBS	Clear all entries and associated settings from the detectedBS table.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.14 rfConfig - RF Setup Commands

The rfConfig mode allows you to view and modify the subscriber RF settings. The following table lists all commands available in this mode.

Important: The subscriber must be rebooted before changes to the rfConfig frequency settings become effective

Table 21: CLI - rfConfig - Radio Frequency Commands

Command	Description
reset	Reset all RF parameters to factory default values. Requires confirmation.
set	Modify RF parameters. **MaxRngRetries**: Max number of retries for initial ranging **MaxTxPower**: Tx Max Power value for ATPC control (-12.00 to 20.00) **Nomadic**: When enabled, subscriber performs frequency scan following any reboot/power-cycle. 0 - Disable 1 - Enable **RxAgc**: Receive automatic gain control AGC). 0 - Enable 1 - Disable **RxGain**: Set Rx gain (-19.00 to 80.00). Not accessible when RxAgc is enabled. **StickinessTimer**: When non zero, specifies the timeout in seconds when attempting to re-register with the same base station following any deregistration event. **TxFixedGain**: Perform Tx power scan during network entry. 0 - Enable 1 - Disable **TxFixedPower**: Tx Gain. Value between: -10.00 and +20.00 **LoRfFreq1**: Lower limit of the 1st Frequency Scan Interval (KHz). **HiRfFreq1**: Upper limit of the 1st Frequency Scan Interval (KHz). **FreqPriority1**: Priority of the 1st Frequency Scan Interval. ... **LoRfFreq16**: Lower limit of the 6th Frequency Scan Interval (KHz). **HiRfFreq16**: Upper limit of the 6th Frequency Scan Interval (KHz). **FreqPriority16**: Priority of the 1st Frequency Scan Interval.
show	Show the current setting for all parameters.

Notes:

1. LoRfFreqN/HiRfFreqN: Scanning ranges must not intersect or overlap. When changing settings, the order of data entry must ensure the 'Hi' setting is always greater than the 'Lo' setting. For example, when changing from the default setting 'Hi=0, Lo=0' you must enter the Hi setting first. When specifying a single channel, enter the RF frequency in the 'Hi' setting, and then enter the identical value in the 'Lo' setting.
2. Nomadic: The subscriber can now be configured for fixed or nomadic service. In fixed mode the subscriber attempts to re-register with the same base station following a power-cycle (does not perform frequency scan). This reduces the subscriber startup time.In nomadic mode, it is assumed the subscriber will operate at different locations. The subscriber

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

performs a frequency scan after each power-cycle to assess the current availability of base stations.

3. StickinessTimer: Subscribers may occasionally experience unexpected deregistrations (e.g., not power-cycle). If the timer is set to a non-zero value, the subscriber will attempt to reconnect with the same base station. If the subscriber is unable to re-register within the specified period, the regular process will be used to select the next base station.
4. MaxTxPower: When Automatic Transmit Power Control (ATPC) is enabled, the base station automatically adjusts the Tx power level for the subscriber to match link conditions. The operator may now set a limit for the maximum Tx power level. For example, set the subscribers maximum Tx power to 8 dBm:

   ```
   SUI# rfConfig set MaxTxPower 8
   ```
5. FreqPriorityN: The operator can now specify a preferred channel frequency (rfConfig). This selection receives priority whenever the subscriber must select a base station. Each frequency entry may have a priority value from 0 to 15. When multiple entries have the same priority (default priority is 7), priority is based on CINR.

   For example, set the priority of frequency range #1 to priority 7:

   ```
   SUI# rfConfig set FreqPriority1 7
   ```

Frequency scanning

A frequency scan is triggered by any of the following events:

i) The RF parameters or bsIdTable are modified.

ii) Subscriber reboot/power-cycle when Nomadic is enabled.

iii) There are no base stations in the scanning results table.

Frequency scanning is performed in 250 KHz steps, monitoring each step for approximately four seconds. The subscriber always completes the entire scan for all non-zero frequency ranges. If all frequency ranges are zero, the subscriber will scan the entire 200 MHz range of the radio (approx. 55 minutes).

During the frequency scan, the subscriber compiles a table of detected base stations. Information for any base station not listed in the bsIdTable is discarded. and orders the results based on priority (frequency and bsId table entry) signal level (CINR). Once the scan is completed, the table is saved in non-volatile RAM (preserved through subscriber reboot/power-cycle).

Following any of the events listed above, the subscriber attempts to register with the selected base station in the scanning results table. Once registered, the subscriber remains connected to that base station. If the connection to the base station is lost while the subscriber is online (e.g., base station rebooted), that base station is removed from the scanning results table. As required, the subscriber attempts to register with the next base station in the scanning results table, removing the entry if it can not register with that base station.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.15 set - Set Commands

The set mode can be used to directly modify all available subscriber parameters. The parameters listed in this table do not have a separate mode, and can openly be modified by the set command.

Enter a new value for one or more fields in mode.

set [Enter] Display all fields.

Modify selected field(s).

set [mode] [field] [value] [value] [field] […] <ENTER>

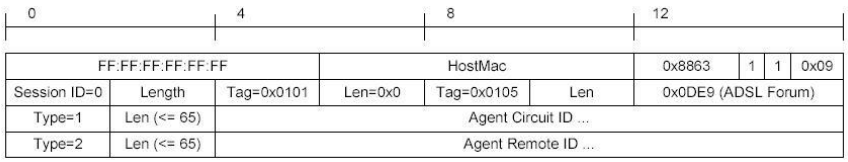
Table 22: CLI - set - Modify Subscriber Parameters

Command	Description
boardConfig	**RefOscFreq**: Enter the reference oscillator frequency (Hz). Must be 32000000 or 40000000. **TxIfFreq**: Enter Tx IF frequency (Hz): Around 44000000 Hz **RxIfFreq**: Enter Rx IF frequency (Hz): Around 44000000 Hz **RfType**: Select RF type. 0 - None 1 -Radia 3.5 GHz 2 - Radia 5.8 GHz 3 - SMI 4 - Factory test **IfPresent**: Enter IF present indication. 0 - Baseband only. 1 - IF present. **TxSpectrumInv**: Tx Spectrum inversion mode. 0 - disabled 1 - Enabled. **RxSpectrumInv**: Rx spectrum inversion mode. 0 - disabled 1 - Enabled. **Buzzer**: Enable or disable the audible antenna alignment buzzer. 0 - disabled 1 - Enabled. **DebugLog**: 0 - Disable debug log messages. 1 - Enable debug messages in event log.
bridgeFilter	Enable or disable the bridge filter. Valid for software version 2.0.21 and later (replaces dlLearnFilter command). 0 -- Disable bridge filter. 1 -- Enable bridge filter.
bsIdTable	**BsId**: Enter MAC address of base station. **Priority**: Enter priority from 0 to 7 (highest). **EntryNumber**: The entry position in the table (first available free entry if unspecified). Note: Modifying the BsIdTable will trigger a frequency scan. Refer to section 4.3.14: rfConfig - RF Setup Commands on page 39 .
dataTraffic	The operator can remotely disable and enable user access to the wireless interface (e.g., enforcing restricted hours of service). When this feature is

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 22: CLI - set - Modify Subscriber Parameters	
	enabled, user data traffic received on the Ethernet port is not forwarded to the wireless interface. This feature does not affect remote wireless access to manage the subscriber or local Ethernet access for maintenance and troubleshooting. For example, disable user data traffic on the subscriber: 0 -- Disable data traffic. 1 -- Enable data traffic.
dhcpRelayAgent	Use this setting to enable or disable the DHCP relay setting. 0 -- Disable DHCP relay agent. 1 -- Enable DHCP relay agent. This feature must be enabled to use DHCP Option 82.
dlLearnFilter	Use this setting to enable or disable the DL learning filter. Valid for software version 2.0.20 and earlier (replaced by bridgeFilter command). 0 -- Disable filter - Do not filter DL packets. 1 -- Enable filter - Only forward DL packets based on learned hosts.
ethTag	Setup the Ethernet tagging parameters. **Active**: Select Ethernet tagging mode. 0 - tagging inactive 1 - tagging active **Priority**: Enter priority from 0 to 7 (highest). **Value**: Enter VLAN tag ID (1-4096). **FilterOn**: Select filtering mode: 0 - filter inactive 1 - filter active **PriorityCopy**: Select priority mode. 0 - Use value entered in Priority field. 1- Copy 802.1p tag.
ethernet	Use this setting to modify the Ethernet port auto negotiation, link speed, and duplex settings. **AutoNegEnabled** *<value>* 0 -- Disabled 1 -- Enabled. **LinkSpeed** *<value>* 0 -- 10M 1 -- 100M. **LinkDuplex** *<value>* 0 -- Half 1 -- Full.
ipAddress	Enter the subscriber IP address. **Address**: Enter IP address. **Mask**: Enter subnet mask. **Yes**: Confirmation to proceed without prompting, 'Are you sure?'
managedSS	The managedSS command allows you to configure the subscriber for independent operation, or enable management using the RedMAX EMS system. The managedSS parameter is controlled from root mode. The following table lists all commands available for managedSS. 0 - Disable remote management 1 - Enable remote management
modThresh	Enter the modulation threshold values for connection to the base station. **Rate1Exit**: RW Rate 1 exit threshold. Value > 0

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 22: CLI - set - Modify Subscriber Parameters	
	Rate1Entry: RW Rate 1 entry threshold. Value > Rate1Exit **Rate2Exit**: RW Rate 2 exit threshold. Value > Rate1Entry **Rate2Entry**: RW Rate 2 entry threshold. Value > Rate2Exit **Rate3Exit**: RW Rate 3 exit threshold. Value > Rate2Entry **Rate3Entry**: RW Rate 3 entry threshold. Value > Rate3Exit **Rate4Exit**: RW Rate 4 exit threshold. Value > Rate3Entry **Rate4Entry**: RW Rate 4 entry threshold. Value > Rate4Exit **Rate5Exit**: RW Rate 5 exit threshold. Value > Rate4Entry **Rate5Entry**: RW Rate 5 entry threshold. Value > Rate5Exit **Rate6Exit**: RW Rate 6 exit threshold. Value > Rate5Entry **Rate6Entry**: RW Rate 6 entry threshold. Value > Rate6Exit
nomadic	Select the nomadic mode. 0 - Disable nomadic mode. 1 - Enable nomadic mode.
phyConfig	Configure PHY parameters. **Bandwidth**: Enter the Bandwidth value (KHz): Accepted values are: 1750, 3500 or 7000. **FftSize**: Enter the FFT size. Accepted values are: 128, 256, 512, 1024 **SmplFactorNum**: Enter the sampling factor numerator (typ. 8). **SmplFactorDen**: Enter the sampling factor denominator (typ. 7). **CyclicPrefix**: Enter the cyclic prefix (as a fraction 1/x). Accepted values are: 4, 8, 16, and 32.
pppoe	Select the DSL Forum VSA in PPPoE Vendor-Specific Tag (RFC4679) mode. 0 - Disable pppoe 1 - Enable pppoe
	
privacySS	Select the privacy mode. Enabled - 0 -- to disable privacy, 1 -- to enable privacy. UseTestTimers - 0 -- Use programmed timers, 1-- Use test defaults.
rfConfig	Configure RF parameters. **TxFixedPower** - Enter the new Tx Gain value between: <-12.00 - 20.00> **RxGain** - Inaccessible due to AGC enabled ! **TxFixedGain** - 0 - Use Tx power scan during network entry 1 - Use fixed Tx power (disables power scan). **RxAgc** - 0 - Disable AGX on Rx. 1 - Enable AGC on Rx. **LoRfFreq1** - Lower limit of the 1st Frequency Scan Interval. All frequency range settings must not intersect with any other active interval. Enter 0 to reset range. **HiRfFreq1** - Upper limit of the 1st Frequency **FreqPriority1** - Priority attached to the freq range 1

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 22: CLI - set - Modify Subscriber Parameters	
	... **LoRfFreq16** - Lower limit of the 16th Frequency **HiRfFreq16** - Upper limit of the 16th Frequency Scan Interval. **FreqPriority16** - Priority attached to the freq range 16 **MaxRngRetries** - Max number of retries for initial ranging **StickinessTimer** - Time-out in seconds **MaxTxPower** - Enter the new Tx Max Power value. Accepts values between 0.00 and 20.00. **Nomadic**: Configure the nomadic mode. 0 -- Disable nomadic operation. 1 -- Enable nomadic operation.
status	System statistics counters. **DcdCrcCount** - DCD CRC errors. **DcdErrCount** - DCD semantic errors. **DcdRxCount** - DCDs parsed. **DlByteCount** - DL data bytes received. **DlCrcErrCount** - DL data CRC errors. **DlfpCount** - DLFPs received (eq. to frames). **DlfpCrcCount** - DLFP semantic errors. **DlfpErrCount** - DLFP semantic errors. **DlHCrcErrCount** - DL data HCRC errors. **DlMapCount** - DLMAPs parsed. **DlMapCrcCount**- DLMAP CRC errors. **DlMapErrCount**- DLMAP semantic errors. **DlMpduCount** - DL MPDUs received. **DlSduCount** - DL SDUs received. **LostFrames** - Logical frames lost. **MgmtCrcCount** - Management messages CRC errors. **MgmtErrCount** - Management messages semantic errors. **MgmtRxCount** - Other management messages parsed. **ModemResets** - Modem reset due to errors. **TotalBwReqCount** - Bandwidth requests sent. **TotalCrcErrors** - Payload CRC errors. **TotalHCrcErrors** - Header CRC errors. **TotalMgmSentCount** - Other management messages sent. **TotalPaddingCount** - Padding MPDUs sent. **TotalRngReqCount** - Ranging requests sent (including initial). **TotalTxBurstCount** - Bursts Transmitted. **UcdCrcCount** - UCD CRC errors. **UcdErrCount** - UCD semantic errors. **UcdRxCount** - UCDs parsed. **UlByteCount** - UL data bytes sent. **UlMapCount** - ULMAPs parsed. **UlMapCrcCount** - ULMAP CRC errors. **UlMapErrCount** - ULMAP semantic errors. **UlMpduCount** - UL MPDUs sent. **UlSduCount** - UL SDUs sent.
sysContact	Enter device administration contact information. **<text>** - Enter a maximum of 255 text characters. Descriptions containing

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 22: CLI - set - Modify Subscriber Parameters	

	blank spaces must be quoted.
	`Example:`
	`set sysContact AJones:123-456-7890`
	`set sysContact "Alan Jones Phone 123-456-7890 Ext 123"`

sysLocation	Enter the device location information. **<text>** - Enter a maximum of 255 text characters. Descriptions containing blank spaces must be quoted.
sysName	Enter the device name information. **<text>** - Enter a maximum of 255 text characters. Descriptions containing blank spaces must be quoted.
variable	**NameValue** - The variable name and value pair, (i.e. nn=x). If the value part is absent, the variable is deleted.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.16 show - Show Commands

The fields in this section are available only by using the show command. The following table lists all functions available in this mode.

Table 23: CLI - show - Show Commands

Command	Description
boardConfig	Board configuration settings. Example: SUI#> show boardConfig Structure --- <<SS Mmgt Board Configuration Parameter>> Transmit Receive IfFreq:..... ..44000000 Hz IfFreq:.....44000000 Hz SpectrumInv: .disabled(0) SpectrumInv:. disabled(0) Others RefOscFreq:.....32000000 Hz RfType:.....RF-Magic(4) IfPresent:.....IF_Present(1) Buzzer:.....disabled(0) DebugLog:.....disabled(0)
bridgeFilter	Bridge filter control setting. Example: SUI#> show bridgeFilter SS DL Learn Filter status: Enabled(1)
bsidTable	Allowed BS table. Example: SUI#> show bsIdTable Structure --- <<SS Mmgt BsIdTable Data>> BsId Entries Total Effectives Id0:.....00:00:00:00:00:00 Count:.....0 Priority0:.....0 Id1:.....00:00:00:00:00:00 Id15:.....00:00:00:00:00:00 Priority15:.....0
dataTraffic	Data traffic control settings. Example: SUI#> show dataTraffic SS DataTraffic control status: Enabled(1)
detectedBS	Show details for detected base stations. Including frequency and CINR. For example: *<< Detected BSID Table >>* *0) ..... 00:09:02:00:a3:5d Freq 3424000 kHz Cinr 305 dBm*
dhcpRelayAgent	Show the SS DHCP Relay Agent setting. Example: SUI# show dhcpRelayAgent SS DHCP Relay Agent: Enabled(1)
ethernet	Display the Ethernet port settings: Example: SUI# show ethernet Structure --- <<SS Ethernet settings>> AutoNegEnabled:.....Enabled(1) LinkSpeed:.....100M(1) LinkDuplex:.....half(0)
ethPortStatistics	Ingress and Egress Statistics: Example: SUI#> show ethPortStatistics Structure --- <<Ethernet port Statistics>>

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 23: CLI - show - Show Commands	
	64 bits Ingress Counters 64 bits Egress Counters Octets:....48:3920599840 Octets:.....15:511896840 UnicastPkts:..3501311040 UnicastPkts:.....1082273438 MulticastPkts.....0 MulticastPkts:.....0 BroadcastPkts:.....0 BroadcastPkts:.....0 Ingress Counters Egress Counters Octets:.....3920566900 Octets:.....511896840 UnicastPkts:..3501311040 UnicastPkts:.....1082273438 MulticastPkts:.....0 MulticastPkts:.....0 BroadcastPkts:.....0 BroadcastPkts:.....0 Discards:.....980060 Discards:.....0 Errors:.....0 Errors:.....0 UnknownProtos:.....0
ethTag	Ethernet tagging settings. Example: SUI#> show ethTag Structure --- <<SS Ethernet Tagging Data>> Active:.....active(1) Priority:.....0 Value:.....0 FilterOn:.....off(0) PriorityCopy:.....off(0)
eventLog	Display the event log messages. Refer to RedMAX Operations and Maintenance Guide for details.
interfaces	Display information about the subscriber wireless and Ethernet interfaces. For example: *ifIndex Desc MAC Address ifAdminStatus ifType ifMtu* *1 802.16 00:09:02:00:8c:7f 1 184 2048* *2 802.3 00:09:02:00:8c:7f 1 6 1500*
interfaces	Display information about the subscriber wireless and Ethernet interfaces. For example: *ifIndex Desc MAC Address ifAdminStatus ifType ifMtu* *1 802.16 00:09:02:00:8c:7f 1 184 2048* *2 802.3 00:09:02:00:8c:7f 1 6 1500*
ipAddress	SS IP address information. Example: SUI#> show ipAddress Structure --- <<SS IP Address Data>> Address:.....192.168.2.100 Mask:.....255.255.255.0 Dhcp:.....Disabled(0)
learnedHosts	MAC addresses of all learned hosts. Example: SUI#> show learnedHosts stored: 1, length: 10, alloc: 256 00 00:00:02:00:01:00
managedSS	Managed SS control setting (where 1 = enabled). Example: SUI#> show managedSS SS managing status: Managed(1)
modThresh	Modulation level required to register with BS. Example: SUI#> show modThresh Structure --- <<Modulation Rate Threshold Parameters>> Rate1Exit:.....9.50 dB

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 23: CLI - show - Show Commands	
	Rate1Entry:.....10.50 dB Rate2Exit:.....12.00 dB Rate2Entry:.....13.00 dB Rate3Exit:.....16.50 dB Rate3Entry:.....17.50 dB Rate4Exit:.....19.50 dB Rate4Entry:.....20.50 dB Rate5Exit:.....23.00 dB Rate5Entry:.....24.00 dB Rate6Exit:.....26.00 dB Rate6Entry:.....27.00 dB
nomadic	Nomadic control setting. Example: SUI#> show nomadic SS Nomadic control status: Enabled(1)
phyConfig	Phy configuration settings. Example: SUI#> show phyConfig Structure --- <<SS Mmgt PHY Configuration Parameter>> Bandwidth:.....7000 kHz FftSize:.....256 PsDuration:.....500 PsPerOFDMSymbol:.....80 SmplFactorNum:.....8 SmplFactorDen:.....7 nsec CyclicPrefix:.....4 PS
ppppoe	PPPoE tagging status. Example: SUI#> show pppoe SS PPPoE tagging status: Disabled(0)
privacySS	privacy related settings on SS. Example: SUI#> show privacySS Structure --- <<SS privacy Data>> Enabled:.....Disabled(0) UseTestTimers:.....Normal(0) AuthWaitTime:.....10 ReauthWaitTime:.....10 AuthGraceTime:.....600 OperationalWaitTime:.....1 RekeyWaitTime:.....1 TekGraceTime:.....3600 AuthRejectWaitTime:.....60 Suites:.....0
registeredBsId	MAC address of registered BS. Example: SUI#> show registeredBsID Registered BS 00:09:02:00:89:94
rfConfig	RF Configuration Example: SUI#> show rfConfig Structure --- <<SS Mmgt RF Configuration Parameter>> Transmit Receive --- FixedPower:.....0.10 dBm Gain:.....0.20 dB ActualPower:.....0.10 dBm RfRssi:.....-46.30 dBm Lock:.....yes(1) Lock:.....yes(1) FixedGain:.....true(1) Agc:.....enabled(1) Frequency Others --- LoRfFreq1:....3450000 kHz RfTemp:.....25 Celsius HiRfFreq1:....3450000 kHz MaxRngRetries:.....3

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 23: CLI - show - Show Commands	
	Priority1:.....7 StickinessTimer:.....10 sec LoRfFreq2:.....0 kHz MaxTxPower:.....0.20 dBm HiRfFreq2:.....0 kHz ModThreshold:.....BPSK1/2(0) Priority2:.....0 Nomadic:.....Enabled(1) ... LoRfFreq3:.....0 kHz HiRfFreq3:.....0 kHz Priority16:.....7 RfFreq:.....3450000 kHz
serialNumber	Display the serial number of this subscriber unit. Example: SUI(show ->)#> serialNumber Serial Number: 0009020300f6
snmpAccCtrl	Display SNMP access community strings. *For example:* *AN-100U(show->)#> snmpAccCtrl* << SNMP Access Control Table >> Read Access string: Write Access string: IP Address: public private 0.0.0.0 public 1 public 1 0.0.0.0
status	Management Status. *For example:* *SUI#> show status* *Structure --- <<SS Mmgt Status Data>>* *Downlink General Uplink General* *fpCount:.....85816069 MapCount:.....85816069* *fpErrCount:.....19 MapErrCount:.....0* *fpCrcCount:.....1 MapCrcCount:.....0* *MapCount:.....1716137 ByteCount:.....47419393* *MapErrCount:.....0 SduCount:.....1646019863* *MapCrcCount:.....0 MpduCount:.....1650724775* *ByteCount:.....911510512* *SduCount:.....1662062959* *MpduCount:.....62677848* *HCrcErrCount:.....0* *CrcErrCount:.....30* *Management Downlink Chan Desc* *RxCount:.....6996 RxCount:.....214516* *ErrCount:.....0 ErrCount:.....0* *CrcCount:.....0 CrcCount:.....0* *ChangeCount:.....0* *Uplink Chan Desc Others* *RxCount:.....214517 Rssi:.....-15.2* *ErrCount:.....0 Snr:.....31.2* *CrcCount:.....0 FreqOffset:.....-1* *TCnt:.....0* *ModemResets:.....49* *LostFrames:.....53* *FrameDuration:.....5000* *RngTimeCorrection:.....-97* *TotalHCrcErrors:.....0* *TotalCrcErrors:.....30* *TotalTxBurstCount:...77106720* *TotalRngReqCount:.....6*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Table 23: CLI - show - Show Commands	
	TotalBwReqCount:.....77238250 *TotalMgmSentCount:.....6988* *TotalPaddingCount:...84435543* *RfRssi:.....-46.1* *TxPower:.....0.1* *LinkStatus:.....Registered(1)*
sysContact	Display the system contact information. Example: SUI#> show sysContact sysContact: Arnold Ziffel 967-1111
sysDescr	Display the system description. Example: SUI#> show sysDescription sysDescription: Grid Sector A34
sysLocation	Display system location string. Example: SUI#> show sysLocation sysLocation: Green Acres Farm, 1234 Long Rd.
sysname	Display the system name. SUI#> show sysName sysName: Green Acres Farm - Unit 1
sysUpTime	Display system up time. Example: SUI#> show sysUpTime sysUpTime: 10 days 20:28:19
version	Display the currently running software version. Example: SUI#> show version Current S/W version: 2.2.7 24-9-2009

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.17 snmpAccCtrl

Use the ***snmpAccCtrl*** command to enable access for SNMP managers. All SNMP managers are identified by IP address, port, and community read and write names (strings) and can be individually added and removed from the list.

Table 24: CLI - snmpAccCtrl

snmpAccCtrl <add> <alias> <delete> <edit> <show>

Configure SNMP account access settings.

add <EntryIndex> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>

Create a new SNMP trap. The index value is assigned automatically. Up to eight settings may be entered.

EntryIndex: Unique index number to identify this table entry.

Read Community Name: The SNMP community name with read access.

Write Community Name: The SNMP community name with write access.

Manager Address: The IP address of the SNMP manager.

alias <alias name> <replacement text>

alias name: Text to be replaced

replacement text: Text to substitute for alias

delete <EntryIndex> [All | YesToAll]

<EntryIndex> - Entry index number.

All: Remove all the entries except the first one.

YesToAll: Confirmation to remove all entries.

edit <index> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>

EntryIndex: Unique index number to identify this table entry.

Read Community Name: The SNMP community name with read access.

Write Community Name: The SNMP community name with write access.

Manager Address: The IP address of the SNMP manager.

show

```
        << SNMP Access Control Table >>
 Index: Read Access string:       Write Access string:      IP Address:
   1    public                    private                   0.0.0.0
```


4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.18 smcIpAddress: Assign Static Remote IP Address

The subscriber secondary management channel (SMC) over-the-air IP address, mask, default gateway, Time-of-Day (TOD) server, and TOD time zone offset can be configured using CLI commands. This allows deployment using fixed IP addressing schemes where DHCP is not required/available (e.g., enterprise and SMB). The DHCP request (dhcpRelayAgent) must be disabled when using a static IP addresses.

For example, disable DHCP requests and set a static remote IP address and mask for the SMC channel:

```
SUI# dhcpRelayAgent 0
SUI# smcIpAddress Address 192.168.20.100 Mask 255.255.255.0
```

Table 25: CLI - show - Show Commands	
Description	
View /modify SMC IP address settings.	
Address	IP Address
Mask	Subnet Mask
Dhcp	0 -- static address, 1 -- DHCP allocated address.
Gateway	Default Gateway IP address
ToDServer	Time-of-Day Server IP Address (only when static IP)
ToDHourOffset	Time Zone hour: [-12, 14]
ToDMinuteOffset	Time Zone minutes [0, 59]

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.19 snmpAccCtrl

Use the ***snmpAccCtrl*** command to enable access for SNMP managers. All SNMP managers are identified by IP address, port, and community read and write names (strings) and can be individually added and removed from the list.

Table 26: CLI - snmpAccCtrl

add	**add <Entryindex> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>** Create a new SNMP trap. The index value is assigned automatically. Up to eight settings may be entered. **EntryIndex**: Unique index number to identify this table entry. **Read Community Name**: The SNMP community name with read access. **Write Community Name**: The SNMP community name with write access. **Manager Address**: The IP address of the SNMP manager. Example: SUI#> snmpAccCtrl add 2 ReadCommunity redline WriteCommunity redline ManagerIpAddr 192.168.20.44
alias	**alias <alias name> <replacement text>** **alias name**: Text to be replaced **replacement text**: Text to substitute for alias **delete <EntryIndex> [All | YesToAll]**
delete	**delete <EntryIndex> [All | YesToAll]** <EntryIndex> - Entry index number. **All**: Remove all the entries except the first one. **YesToAll**: Confirmation to remove all entries.
edit	**edit <index> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>** **EntryIndex**: Unique index number to identify this table entry. **Read Community Name**: The SNMP community name with read access. **Write Community Name**: The SNMP community name with write access. **Manager Address**: The IP address of the SNMP manager.
show	**show** SUI#> snmpAccCtrl show << SNMP Access Control Table >> Index: Read Access string: Write Access string: IP Address: 1 public private 0.0.0.0 2 redline redline 192.168.20.44

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.20 softwareUpdate - Software Update Commands

Use the softwareUpdate commands to display the software versions stored in the subscriber non-volatile memory, download software updates from an FTP server, and switch the active versions.

Table 27: CLI - softwareUpdate - Software Update Commands	
loadImage	Download software binary file and save in non-volatile memory (inactive partition). Following download, you must enter the reboot command to run the new software. On the next reboot following a successful download, the subscriber will automatically switch active partitions and run the downloaded file.
show	Display software version information for downloaded binary files. Indicates the active version.
switch	Switch to the currently inactive software version. Confirmation is required. The subscriber will be rebooted. This is done automatically following a successful file download.
sync	Synchronize the binary files saved in the active and inactive partitions. This command copies the 'active' binary file into the inactive partition. Following execution of this command, both partitions (#0 and #1) will contain identical software versions. *For example:* *SUI#> loadImage* *Server IP Address: 192.168.101.102* *File Name: SUI-U1-001-01-00-078.bin* *Opening FTP connection.....* *DoneDownloading image* *.....* *.....* *.....* *DoneProgramming update.....* *DoneErasing setup partition.* *Done.Writing setup partition.* *Done.Erasing boot block.* *DoneProgramming boot block.* *DoneFlash programming complete.* *SUI#>reboot*

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.21 status - Status Information

The status mode allows you to view general subscriber statistics. The following table lists all commands available in this mode.

Table 28: CLI - status - Status Commands

Command	Description
reset	Set all parameters to factory default values.
show	Display the current setting for all parameters. **DlfpCount**: Downlink FPs (frames) received. **DlfpErrCount**: Downlink FP semantic errors. **DlfpCrcCount**: Downlink FP messages with CRC errors. **DlMapCount**: Downlink MAP messages. **DlMapErrCount**: Downlink MAP semantic errors. **DlMapCrcCount**: Downlink MAP messages with CRC errors. **DlByteCount**: Downlink Bytes received. **DlSduCount**: Downlink SDUs received. **DlMpduCount**: Downlink MPDUs received. **DlHCrcErrCount**: Downlink data HCRC errors. **UlMapCount**: Uplink MAP messages. **UlMapErrCount**: Uplink Invalid MAP messages. **UlMapCrcCount**: Uplink MAP messages with CRC errors. **UlByteCount**: Uplink Bytes received. **UlSduCount**: Uplink SDUs received from CL **UlMpduCount**: Uplink MPDUs sent. **MgmtRxCount**: Total management messages. **MgmtErrCount**: Invalid management messages. **MgmtCrcCount**: Management messages with CRC errors. **UcdRxCount**: Uplink Channel Descriptor messages. **UcdErrCount**: Uplink Channel Descriptor messages that are Invalid. **UcdCrcCount**: Uplink Channel Descriptor messages with CRC errors. **Rssi**: Received Signal Strength Indicator. **Snr**: Signal-to-Noise Ratio. **FreqOffset**: Frequency Offset. **TCnt**: Time count of the last burst received. **ModemResets**: Number of times the modem was reset due to errors. **LostFrames**: Number of logical frames lost. **FrameDuration**: Duration in microseconds: 2500 to 20000. **RngTimeCorrection**: Time correction from ranging response. **TotalHCrcErrors**: Header CRC errors. **TotalCrcErrors**: Payload CRC errors. **TotalTxBurstCount**: Transmit burst. **TotalRngReqCount**: Ranging requests. **TotalBwReqCount**: Bandwidth requests. **TotalMgmSentCount**: Management traffic sent. **TotalPaddingCount**: Padding bytes sent. **RfRssi**: Current RSSI value. **TxPower**: Current Tx output power. **LinkStatus**: Registered(1).

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4.3.22 user

The ***user*** command is used to modify the user profiles and passwords.

Table 29: CLI - User Command	
Command	Parameter/Description
access	Change user access level. **name** <username> User login name <access> Access level: 0 for guest 10 for administrator
add	Add a user **name** <username> User login name to be added <access> Access level
delete	Delete a user **name** <username> User login name to be deleted *To delete an administrator account:* *1) change the account to be deleted to access level '0' (guest)* *2) delete the account.*
password	Change user password. User is required to enter/confirm new password for this account. <**username**> - User login name
show	Show all users. For example: *User: admin Access: 10 (Administrator level)* *User: guest Access: 0 (Guest access level)*

4.3.23 VLAN Filtering

VLAN filtering can increase overall security by preventing traffic from being forwarded to unintended receivers. The operator can create a whitelist that includes up to 16 allowed VLANs. When VLAN filtering is enabled, the subscriber discards all uplink and downlink packets not matching an entry in the VLAN ID list. Filtering can be enabled and disabled globally, and each table entry can be individually enabled or disabled.

For example, set tag #3 to VID=33 and enable this tag:

```
SUI# vlanFilters set FilterTag 33 FilterActive 1 3
```

Table 30: CLI - status - Status Commands	
Command	Description
vlanFilters	Filter traffic based on VLAN ID. Enabled Filtering mode: 0 -- Disable, 1 -- Enable. FilterTag VLAN tag ID FilterActive VLAN tag mode: 0 -- Disable, 1 -- Enable. <EntryNum> Entry position in the table (from 1 to 16)

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

Chapter

5

5 Appendices

5.1 Subscriber Log Messages

Refer to RedMAX Operation and Maintenance Guide.

5.2 Upgrade Subscriber

Use the following procedures for all RedMAX subscribers.

Important Notice!

Do not reset or remove power from the SU-O units immediately after rebooting the upgraded SU-O. The software upgrade may require a minimum of two minutes to complete the re-programming. If the upgrade process is interrupted by a reboot or power-cycle, the SU-O may become unmanageable and require that these units be returned to the factory for reprogramming.

The following procedures describe manually updating the base station and subscribers. The subscribers must be updated using CLI while the base station may be updated using CLI or the Web interface. If available, you may use the RedMAX RMS server provisioning features to upgrade the RedMAX software. All upgrades require an FTP server.

Important: Upgrades should be performed during scheduled outage periods. Subscribers may be offline for up to 15 minutes when the sector controller is rebooted.

5.2.1 FTP Server

An FTP server is required for all upgrades. The FTP server must be located on the network connected to an active Ethernet port (Data or Mgmt) on the base station. The following items must be addressed before beginning software upgrades:

6. You must obtain the correct versions of the base station and subscriber binary files.
7. The base station and subscriber perform all software upgrades using an FTP server:
    a) You must copy the base station and subscriber binary files into the default file location for the FTP server (you can not specify a 'path' in the upgrade dialog).
    b) The FTP server must have a user defined as follows:

        Username: **target**

        Password: **secret**

5.2.2 Upgrade Path

Refer to the RedMAX release notes to determine the correct software upgrade path.

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

5.2.3 Connection to Subscriber

If performing the upgrade using the local Ethernet port, it is important to use the correct cables and connections when updating the subscriber.

Subscriber PoE Power Adapter Caution:

Warning to Service Personnel: 48 VDC

Standard Ethernet equipment may be damaged if connected directly to the 'Data + Power Output' port of a PoE power adaptor.

5.2.4 Update Software Procedure

1. Start a telnet session to the subscriber using the following settings:

   Login: **admin**

   Password: **admin**

2. Enter the 'loadImage' command. The subscriber will prompt you to enter the following information:

   Server IP address: **[enter address of FTP server]**

   File Name: **[enter binary file name- including *.bin* extension]**

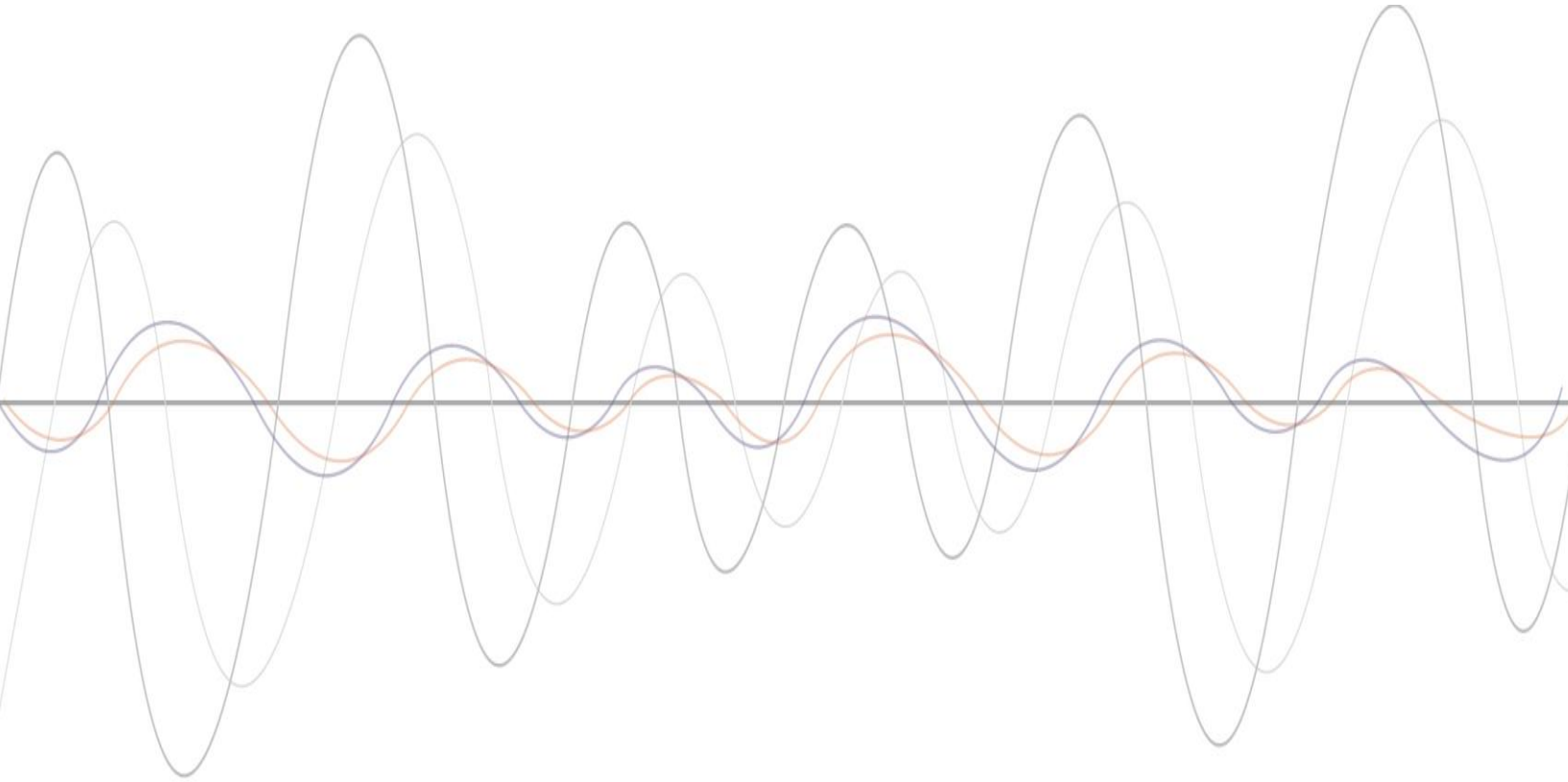
3. The subscriber performs FTP server authentication with user name 'target' and password 'secret' (these settings cannot be altered). The image will be uploaded to the subscriber and saved in the non-volatile memory (flash).
4. The subscriber must be rebooted to load the new software. Enter the 'reboot' command to reset the unit. The telnet session will be terminated.

Example Download Dialog with Subscriber

```
Login: admin
Password:
admin, welcome to the SS CLI. (Version 0.3)
SUO#> loadImage
Server IP Address: [enter ftp server IP address here]
File Name: [enter binary file name here]
Opening FTP connection.....Done
Downloading image
.....
Done
Programming update.....Done
Erasing setup partition. Done.
Writing setup partition. Done.
Erasing boot block. Done
Programming boot block. Done
Flash programming complete.
SUO#>reboot
```


4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299

4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299



4Gon www.4Gon.co.uk info@4gon.co.uk Tel: +44 (0)1245 808295 Fax: +44 (0)1245 808299